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ABSTRACT

This guide is intended for teachers conducting industrial technology education (TE) courses in South Carolina. Presented first is introductory information about the mission, clusters and units, and recommended educational format of TE in South Carolina. Discussed in the seven sections are various aspects of South Carolina's modular delivery system for TE (program design, module development, and modular utilization of the curriculum guide). Sample modules and core competency and word lists are included. The remaining two-thirds of the guide consists of series of lesson plans for the following instructional clusters: communication technology (drafting and design, graphic communication, photographic technology, electronic communication); construction technology (establishing/maintaining construction enterprises and designing, engineering, inspecting, and maintaining/repairing construction projects); energy, power, and transportation technology (control/transmission of power, transportation, engines); and manufacturing technology (management, management and production, management and personnel). Each lesson plan includes the following: title; major concept and topics; behavioral objectives; instructional activities; evaluation activity; list of required tools, equipment, and materials; vocabulary list; and references. Also included is a resource list of 148 references and addresses of numerous technology education-related publishers and government agencies. (MN)

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SOUTH CAROLINA GUIDE FOR INDUSTRIAL TECHNOLOGY EDUCATION

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FOREWORD

Technology is changing the way we live, learn, and work. If we are to keep up with technology and control it, we need to understand it. This instructional guide for Industrial Technology Education is one attempt to meet this challenge in the public schools of South Carolina. This guide was developed and field tested by South Carolina Industrial Technology instructors, Clemson University faculty, and state staff with the purpose of setting a new direction for technology education in grades 7 through 10 in South Carolina.

The content of the Industrial Technology Education instructional guide has been drawn from the four generally recognized systems of technology of communications, construction, energy/power/transportation, and manufacturing. The South Carolina Department of Education, Office of Occupational Education, is committed to the implementation of this curriculum and to assisting administrators and teachers as they develop and maintain quality instructional programs in all areas of technology education.

INDUSTRIAL TECHNOLOGY EDUCATION

MISSION STATEMENT

The mission of Industrial Technology Education is to prepare the student to participate in and adapt to a dynamic technological society. The curriculum provides application and immediate relevance to principles of math, science, and other subject areas. Industrial Technology focuses on the development and application of industrial technologies and develops students who are self-learners and problem solvers, as well as self-reliant and productive members of society.

GOAL STATEMENTS

Consistent with students' abilities, interests, and needs, industrial technology education will:

1. Prepare students to work with technical systems within the areas of communication, production, transportation, and energy/power utilization.
2. Assist students in assessing and preparing for current and emerging occupations.
3. Enhance student mastery of the basics through application of math, science, social studies, communications, and computer literacy.
4. Develop student awareness and skill through the safe utilization of tools, materials, and equipment.
5. Provide students with a foundation in entrepreneurship, economics, and business relationships.
6. Assist students in becoming independent learners and creative problem solvers who possess self-confidence and lifelong learning attitudes.
7. Establish beliefs and values based upon the impact of industry and technology and how they alter environments.
8. Explore and develop human potential related to responsible roles in a technological society.

INDUSTRIAL TECHNOLOGY EDUCATION
CLUSTERS AND UNITS

Industrial Technology Education is an instructional program that provides hands-on exploratory experiences and insights into technology and career opportunities. The major objective of Industrial Technology Education is to provide students with a foundation in safety and the use of tools, equipment, and materials, and familiarity with occupational specific nomenclature. The program also serves as a tech prep/college prep program that enables students to make informed decisions as to their interests and compatibility with occupational areas requiring technological knowledge and competence. It is designed to provide manipulative operations and experiments with tools, materials, processes, and products directly related to the following occupational clusters.

1. Communication Technology

   The communication and media technology curriculum is designed to provide students with an opportunity to become acquainted with fundamentals involved in graphic, audiovisual, and line communications. Included is occupational information related to this important part of our industrial and technological society. Learning experiences include drawing and sketching, letterpress printing, photography, screen printing, radio and television production, and data transmission. Proposed instructional units are:

   Audiovisual Systems
   Basic Drafting
   Computer Aided Drafting
   Computer Utilization
   Graphic Communications
   Basic Photography

2. Construction Technology

   The construction technology cluster curriculum is designed to give students a better understanding of construction technology. The program provides construction concepts and experiences with the tools, materials, and processes used in construction activities, management, and production practices in the construction industry. The proposed instructional units are:

   Design
   Preparing to Build
   Masonry
   Wood Frame Construction
   Electrical Wiring
   Plumbing

3. Energy, Power and Transportation Technology

This curriculum is designed to acquaint students with the transportation industry dealing with power and energy utilization. Energy is classified as chemical, electrical, mechanical, nuclear, radiant, and thermal. The instructional units and activities in this program are:

Transportation Basics and Principles
Introduction to Energy and Power
Small Gas Engines
Mechanical Systems
Fluid Power Systems
Electrical Systems
Solar Energy
Combined Systems
Basic Engine Principles and Design
Space Transportation
Water Transportation

4. Manufacturing Technology

Manufacturing technology is a study of skills and information used in manufacturing processes. It provides learning experiences that fulfill the growing demand for educational programs which deal with important industrial and manufacturing concepts. The instructional units proposed are:

Computerized Numerical Control
Research and Design
Materials and Processes
Casting and Molding
Mass Production
Assembling
Computer-Aided Manufacturing
Industrial Production Management

INDUSTRIAL TECHNOLOGY EDUCATION

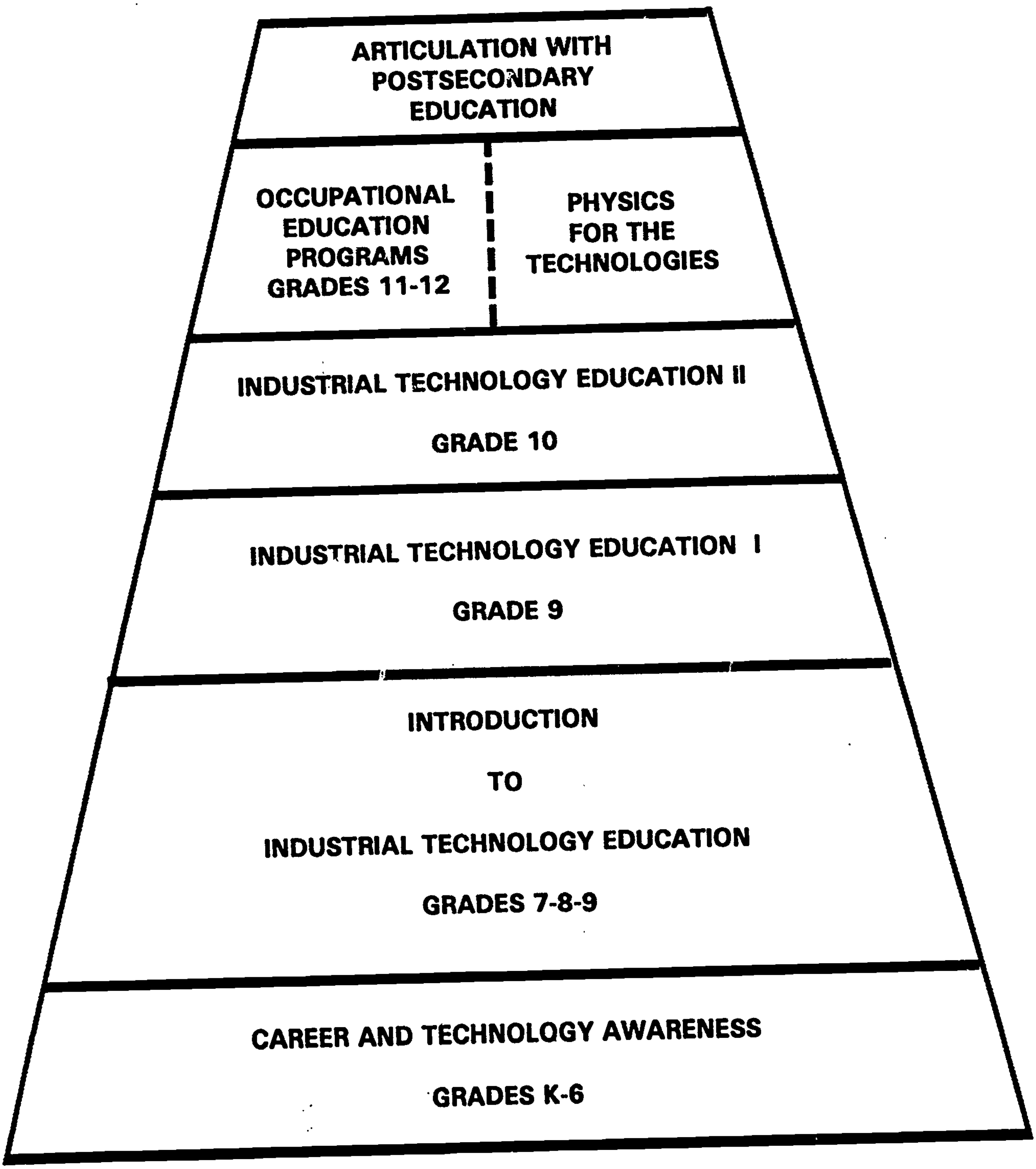
RECOMMENDED INSTRUCTIONAL FORMAT

The Industrial Technology Education Curriculum Guide allows flexible instructional activities at different grade levels for varying lengths of time.

The following instructional formats are suggested:

Grades 7-8	**Introduction to Industrial Technology:** Introduction to all clusters is recommended Communication Technology Construction Technology Energy, Power and Transportation Technology Manufacturing Technology
Grades 9-10	**Communication Technology:** Elective courses one or two semesters in length Graphic Communication Systems Electronics Communication Systems Media Communication Systems Computer Communication Systems Audiovisual Communication Systems **Construction Technology:** Elective courses one or two semesters in length Construction Planning and Design Constructing and Servicing Structures Electro/Mechanical Systems and Services **Energy, Power and Transportation Technology:** Elective courses one or two semesters in length Introduction to Energy and Power Systems Technical Elements Transportation Planning and Designing Transportation Systems Human and Goods Transportation Systems **Manufacturing Technology:** Elective courses one or two semesters in length Manufacturing Materials and Processes Designing Products for Manufacture Manufacturing Production Systems Computer-Aided Manufacturing Industrial Production Management

THE SOUTH CAROLINA PLAN FOR TECHNOLOGY EDUCATION



HOW TO USE THE INDUSTRIAL TECHNOLOGY EDUCATION CURRICULUM GUIDE

Each cluster contains a table of contents that displays a chart indicating the hours per unit recommended for 9- (45 hours), 18- (90 hours), and 36- (180 hours) week courses. Each hour indicated on the units represents a 50- to 55-minute class period. Note that some 9- and 18-week units contain fewer than the maximum hours recommended for a complete unit. Thus, the teacher should select the most educationally sound activities that can be completed in the allotted time and that also contribute to the entire 9- or 18-week course. All units contain more than ample classroom core and advanced instruction and student activities for the time allotted to each unit. The teacher must select unit activities felt most appropriate for his/her learning situation. It is recommended that activities involving a significant degree of psychomotor application be given priority consideration.

I. **TITLE:**
Each unit is identified by a Major Title and Unit Title. The course plan is organized in a sequence that lends a logical starting point and ending point.

II. **MAJOR CONCEPT AND TOPICS:**
Each unit contains a Major Concept. This statement is central to the intent of the lesson. Beneath the Major Concept are related Topics that provide guidance to ways of advancing and deepening learner understanding of the major concept.

III. **BEHAVIORAL OBJECTIVES:**
All objectives are in behavioral terms and can be achieved through the recommended learning activities. The teacher should devise methods to measure the attainment of these objectives through observation and more formalized methods.

IV. **INSTRUCTIONAL ACTIVITIES:**
Unit activities are indicated as "Core" and "Advanced." The core activities are designed for ITE-I level instruction; the advanced activities for the ITE-II level. However, it is understood that activities from either group may be selected depending on the ability and maturity of particular students. Also, there is considerable opportunity for teachers and students to expand any of the activities in an educationally beneficial manner.

V. **EVALUATION:**
Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

VI. **TOOLS, EQUIPMENT, AND MATERIALS:**
Standard, common equipment and materials have not been indicated. Special items have. The teacher should examine the activities to be used and prepare a detailed list of items that may be needed for particular lessons. Many of these items such as tape, scissors, and paper might be obtained from school office supplies; other items such as plastic pipe, cement, or corks will have to be obtained from other local sources. (The major equipment items are also listed on the recommended Industrial Technology Education Equipment List developed by the Office of Occupational Education.)

VII. **APPLICATIONS OF TERMS:**
This list of words has been drawn from the learning activities and relates to the Major Concept. The terms should be included in the instruction and their meanings and applications reinforced at every opportunity.

VIII. **REFERENCES:**
Selected references have been included for each unit. In many instances, references will provide sources of equipment or software referred to in the Unit Activities.

MODULAR DELIVERY SYSTEM
FOR
TECHNOLOGY EDUCATION

SECTION 1

DESIGNING A MODULAR PROGRAM

TRANSITION TO MODULES

As technology educators our main goal should be to make our students technologically literate. We need to prepare our students for life in the twenty-first century by exposing them to as many areas of technology as possible. To reach this goal, the "modular" delivery system has proven to be one of the most efficient methods of teaching technology education.

The modular format for technology education involves a structured program using individual modules to teach a broad-based introduction to the four basic technologies of *communication, construction, energy/power/transportation, and manufacturing*. Each module is composed of a dedicated work area, dedicated equipment, specialized curriculum, and a management system that assists the instructor in the smooth operation of the program.

The modular system offers many advantages over the conventional system of instruction and classroom management. Modules allow the instructor to teach many different subject areas to small groups instead of one subject to the entire class. Modules give the flexibility to change portions of the curriculum as technology changes. It is easier to introduce new technologies by developing a new modular activity guide. Modules provide students with activity oriented, self-paced learning activities that allow each student to progress at his/her own pace.

On the following pages you will find information that was designed to help you make a smooth transition from the traditional instruction methods to the modular approach. The information will help in designing a totally new program and in establishing a system to manage that program.

DESIGNING A MODULAR PROGRAM

Program Description
(decisions you must make to establish your program)

1. Level and Timing

   a. Middle/Junior high or high school (will vary module length and content)
   b. Required or elective course
   c. 9, 18, 36 weeks (will determine number of modules needed)
   d. Length of period (will affect daily content of module)
   e. Will you offer 1 or 2 yearlong courses, or 2 or 4 semester courses?

2. Structure

   a. Number of days in the module (10 most common - Day 10 for evaluation and posttest)
   b. Number of students (must have control; 2 per module times number of modules)
   c. Will module partners rotate? (rotating partners forces students to learn to work with each other)
   d. Module topics covered (how many and what topics)
   e. Title of course/courses (Technology 1 and 2 or Construction, Communication, Manufacturing, and Energy/Power/Transportation, etc.)
   f. Number of years available
   g. Will students do all modules or select a certain number from those available?
   h. Will you use a lab manager, and will that count as a module for him/her?
   i. Will you use "lab aids" as a way to handle excess number of students?

DESIGNING A MODULAR PROGRAM
Education System

1. Module Delivery System

   a. Paired cooperative learning (partners work together)
   b. Defined, focused work space (modular structure focuses attention away from the rest of the class)
   c. Call light system (students don't act up for attention)
   d. Module library (for extra credit research and when day's activities are completed early)
   e. Self-contained module equipment (no need for student to move anywhere in classroom)
   f. Secured student storage
   g. Efficient work space (just the equipment needed and nothing extra should be in the module)
   h. Intercom (teacher reaches all areas of the lab)
   i. Large group meeting space (for discussions and lectures)

2. Student Notebook System (what each student's notebook should contain)

   a. Attendance and activity points records (student always knows where s/he stands grade wise)
   b. Personal records
   c. Calendars and schedules
   d. Grade records (what s/he has earned on each module)
   e. Module records (a form for vocabulary words and research questions)
   f. Lab policy and organization sheet

3. Self-Directed Instruction System

   a. Overview (all aspects present a rigid, structured system; the students are never surprised)
   b. Daily activities (always similar; students get used to the pattern)
   c. Research problems (part of module--questions taken from the reading and video assignments)
   d. Enrichment activities (a list of things to do if the daily modular activity is finished early--always something for the student to do)
   e. Reading time or page assignment (can assign a specific amount of time for reading or specific pages to make sure certain material is covered)
   f. Check-up session (on Day 4 or 5 instructor checks student's progress)
   g. Check-out (last day of module; instructor checks module before releasing student to next module)
   h. Module guide (day by day instructions for the student to follow)
   i. Test review (from vocabulary words and research questions in student's notebook)
   j. Posttest (usually 10 questions from vocabulary words and research questions)

4. Information Delivery System

   a. Reading time (may require set amount)
   b. Video presentations and demonstrations (required for self-directed instruction--teacher-made or commercial)
   c. Computer activities (work well in the modular system)
   d. Modeling, simulation, operation, and construction (the kinds of activities students are involved in)
   e. Exploring and experimenting
   f. Student interaction (learn to work together)
   g. Teacher/Pupil interaction (have time for more personal contact with students)
   h. Learning styles (use a variety of methods to present information)

5. Course Structuring System

   a. Orientation (all things should be named and explained; the students should know what is going on)
   b. Module sessions (all period long)
   c. Discovery days (the whole class brought together for demonstrations, discussions, and lectures)
   d. Special activities days
   e. Wrap-up activities (must schedule days to fly rockets, test bridges, etc.)

6. Discipline System

   a. Personal steps (should be structured, and students should know the progression)
   b. Tardy steps
   c. Advice (try to avoid confrontation; advise students on how to avoid problems)
   d. Step records (keep accurate records of discipline)

DESIGNING A MODULAR PROGRAM
Management System

1. Lab Organization

   a. Moving message board/intercom (keep students informed)
   b. Large group meeting space (you still need a space to get all students together)
   c. Call lights (keep students in their modules)
   d. Security for activities
   e. Self-contained modules (everything needed should be in the module area)
   f. Background music (optional)

2. Student Notebook

   a. Student numbers (each student given a number; notebooks and scheduling done by number)
   b. Attendance and activity points (10 points per day)
   c. Module guide-posttest (10 questions - 100 points)
   d. Research problems (from activities and reading assignments, 10 questions - 100 points)
   e. Enrichment activities (in each module guide to handle any spare time students have)
   f. How complicated; what is included (should be easy for students to use; should include lab policies, module record sheet to record attendance, research questions, vocabulary words, posttest answers, a place to calculate the total module grade, and discipline rules and records)

3. Class Organization

   a. Orientation/Length (orientation sessions should be spread out over several days; mix with demonstrations)
   b. Module sessions (utilize a discovery or special activity day between modules)
   c. Discovery day/special activity days (there are still times when you will want to get the whole class together to demonstrate or lecture)
   d. Wrap-up activities (test the results of your modules)

SUGGESTED MODULE FORMS

FORMS FOR TEACHER USE:

1. Module Schedule Form - Should have a place for student names, module titles, and a way to indicate what module a student has been assigned.

2. Student Number Form - To be posted in the classroom to remind students of their numbers. The student number usually starts with the number of the class period.

3. Student Record Sheet - A form used to keep track of each student's module performance. The form should have a place for the student's name and number and be separated into areas to place the outcome of each module attempted. The entry can be handwritten or cut and pasted from each student's module record sheet, the design of which will be discussed in "Forms for Student Use."

4. Module Posttests - Usually 10 multiple choice or true/false questions worth 10 points each.

5. Posttest Answer Key - Designed to work with the layout of the posttest.

6. Semester Schedule - Indicates which days will be module days and which days will be used for other activities.

7. Attendance and Activity Sheet - If you choose to award points for attendance and daily points for participation you should design such a form for each student.

8. Discipline Record Sheet - A form for you to keep track of tardies and discipline infractions.

9. Student Locator Sheet - A diagram of your lab layout indicating all module locations. On this sheet, you can enter the names of the students in the module areas to which they are assigned, allowing you to keep students where they belong.

FORMS FOR STUDENT USE:

1. Lab Policy and Organization Sheet - To be in each student's notebook. The sheet should outline lab policy, rules, and organization.

2. Module Record Sheet - The student's main record keeping form. This form should have spaces for the student to record vocabulary word definitions, answers to research questions, and a place to answer posttest questions. This form often is designed with a small removable box where all points earned are recorded. The instructor removes this section and pastes it into his/her student record sheet.

3. Student Scheduling Sheet - A form to allow the student to express a preference in module selection--if you choose to allow student selection.

TECHNOLOGY MODULE DEVELOPMENT
Module Development Tips

1. Determine the student outcome you desire (not the project; what you want the student to learn).

2. Select activities.

3. Develop or purchase apparatus (avoid large or expensive equipment).

4. Pilot test activities with students.

5. Refine homemade apparatus.

6. Select module library using more recent texts.

7. Organize equipment/supplies/material.

8. Outline day by day module.

9. Input/Type instructions.

10. Write module guide, test review, and posttest.

11. Pilot test during module session (watch and discuss with students).

12. Don't forget teacher-made videos (5-10 minutes, 15 minutes maximum).

13. Rewrite as necessary.

TECHNOLOGY MODULE DEVELOPMENT
Discipline and the Modular Delivery System

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1. We need to change the students' attitudes; we need to train them to do what is right because it is right.

2. "Radar detector syndrome" - only do what is right when you think someone is watching.

3. Structured discipline outcomes take the confrontation out of teacher student interaction.

4. Handle low key; apologize for having to impose discipline.

5. Take the person doing wrong away from the group to deal with him/her.

6. Eliminate potential problems:
   * have tools and supplies in module -- no reason for student to move around the room.
   * call light -- student doesn't need to overreact to get attention.

7. All discipline actions recorded on a sheet in the student's notebook -- great during parent conference.

8. Students contained in pairs.

9. The work station focuses the student's attention away from the rest of the class.

10. Call lights -- put teacher in control.

11. Reading time -- always working.

12. Everything needed in the module there -- nothing extra to get.

13. Student notebook -- controls discipline.

14. Self-directed with rigid structure -- the students are never surprised.

TECHNOLOGY MODULE DEVELOPMENT
What Won't Work (in modular instruction)

1. 9 pages of instructions for a 50-minute class.
2. The change to modules must come from the teacher -- it cannot be dictated by the administration.
3. Slow transition -- all modules or none.
4. Lack of computer and word processing skills.
5. Old shop -- need new look.
6. Supplies are not ready in the module.
7. Teacher doesn't role model "Clean up and pitch in."
8. Students don't feel an ownership in the lab.
9. Poor management skills.
10. Instructions not at the module site.
11. Self-directed works; self-paced doesn't.
12. A lot of equipment needs to be moved around.
13. Students with cans of spray paint. Instead, put gloss latex enamel in a squeeze bottle (ketchup or mustard bottle, etc.), squeeze out a small amount into small cup (like mini ketchup cup from fast food restaurant), and paint with a piece of foam held in a spring clothespin.
14. Not always observing what is happening in the lab.

SUGGESTED MODULE TOPICS

COMMUNICATION
Photography
Electronic Publishing
Video Production
Engineering Graphics
Electronics
Radio Broadcasting
Computer Aided Drafting (CAD)
Laser Applications
History of Telecommunications
Electronic Communications
Screen Printing
Audio Production
Computer Applications
Basic Drafting
Laser and Fiber Optics
Audiovisual Communication
Electronics
TV/Video Production
Architectural Design

ENERGY/POWER/TRANSPORTATION
Ground Transportation
Water Transportation
Air Transportation
Rocketry and Space
Fluid Power
Mechanical Power
Power Tech. (small engines)
Alternate Energy
Power Production
Mag-Lev
Research and Design (CO_2 car)
Vehicle Design
Aerodynamics
Hydroponics
Electricity
Automotive Systems
Hydraulics/Pneumatics
Flight Technology
Transportation Systems

MANUFACTURING
CNC Lathe
CNC Mill
CIM/CAM
Robotics
Research and Design
Plastics
Materials and Processes
Environmental Impacts of Mfg.
Casting and Moulding
Mass Production
Future Technologies
Problem-Solving Technologies

CONSTRUCTION
Engineering (bridge building)
Electric Wiring
Plumbing
Concrete and Masonry
Framing Structures
Testing Construction Products
Architectural Design
Air Supported Structures
Construction Processes
Urban Planning
Site Preparation
Measurement
Structures Technology
Experimental Structures

CAREER EXPLORATION

Career exploration is an important component in the study of technology education. The study of careers can be approached through several formats: 1) ten-day module, 2) whole class activity, 3) extra credit, and 4) follow-up to a field trip. Below are ideas that can be incorporated in developing career awareness activities.

1. Introduction to technology.
    a. Careers in Communications
    b. Careers in Manufacturing
    c. Careers in Construction
    d. Careers in Energy, Power and Transportation
2. History/Background.
    a. Research questions
    b. Study guide
3. Develop time line of technology.
4. Vocabulary words.
5. Career explorations.
    a. Videos (ETV, ITV, etc.)
    b. Books (DOT, Encyclopedia, etc.)
    c. Software (SCOIS, MECC, etc.)
6. Media Center research.
    a. Videos (ETV, ITV, etc.)
    b. Books (DOT, Encyclopedia, etc.)
    c. Software (SCOIS, MECC, etc.)
7. Forms/Questions to guide research.
8. Write ideal resume for chosen career field.
9. Research local career availability.
    a. Newspaper advertisements
    b. Television
    c. Radio
    d. State employment agencies
    e. Private employment agencies

The promotion of sex equity in career exploration involves creating an educational environment which helps students free themselves of limiting sex role expectations and fosters preparation for future family and work roles. Sex equity is defined as the fair and just treatment of individuals, which allows them to: (1) choose educational programs and careers; (2) enter programs and careers according to their needs, informed interests, and abilities; and (3) participate fully and benefit from those programs without regard to their sex.

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TEACHER'S GUIDE TO MODULAR INSTRUCTION

INTRODUCTION

The modular technology lab provides a unique and efficient method of transmitting information through a flexible management system. Technology education programs are using various elements of the modular approach to implement innovative programs.

In the modular technology lab, all learning is self-directed. The modular program of instruction of the technology education lab sharpens students' conceptualizing abilities. Students will be challenged to discover the underlying principles of technology and to apply those principles through the use of critical thinking, problem solving, and decision making. The modular instructional approach facilitates not only a mastery of technological subject matter, but mastery of the process itself. Students engage directly in the observation, exploration, application, and assessment of technological phenomena. The students learn that technology is not passive--it is active and ever changing. Its components are interdependent.

The modular approach revolves around the use of self-directed instructional guides. Usually, two students are paired in a module for a prescribed length of time, dependent upon the length of the course. Within the prescribed time, the students will take a pretest and a posttest, as well as participate in a variety of hands-on and research activities. At the conclusion of the module, the students will rotate to a new module and new partner.

An important component of the modular technology lab is its management capability. The management system not only will enhance the student's total educational experience, but also will enable the instructor to spend quality time facilitating learning. The key components of the management system are created out of the following:

- Pretests and Posttests
- Research Questions Record Sheets
- Vocabulary Record Sheet
- Journal Entries
- Video Viewing
- Student Record Forms
- Daily Student Record Sheets
- Student Notebook/Activity Notebook
- Notebook Storage

The following will prepare the instructor for the modular curriculum approach as well as aid in general classroom management for the technology education lab.

CLASSROOM MANAGEMENT FOR STUDENT ORIENTATION

Day One

1. Define technology education for the students.

2. Discuss your expectations for the technology education lab with the students. Your expectations should reflect your ideas on how to enter the classroom area and lab area, and general classroom behavior consistent with school policy.

3. The technology education lab will be different to most students from any other classroom they have ever seen. Therefore, it is important to allow the students to tour and explore the lab. This may be a good time to introduce safety procedures in the lab.

4. Give the students the parent letters explaining the technology education lab, and ask to have the letter signed by their parents/guardians.

5. Give the students their lab identification numbers.

6. Explain to the students about the technology education lab notebook.

7. Give the students the handout about the technology education lab, and discuss the handout with the students. Explain the details of the handout with the students to assure that they understand the information in it.

8. Allow the students to put the handouts in their technology education lab notebooks.

Day Two

1. Complete the discussion of the handout.

2. Present overview of how the class will operate.

3. Present a lesson on general safety in the classroom and lab areas. This may include hand tools, portable power tools, and machines.

4. Explain expectations for working in the self-directed module: how to take the pretests and posttests; procedures for using vocabulary sheets, reading times, and study questions; and procedures for video viewing and using computers (how to get menu, how to insert disks, etc.).

5. Give the students the Module Information Sheet for module selection on Day 3.

Day Three

1. Module selection/assignments.

2. Discuss equipment operation and safety.

MODULE WORKSTATION SCHEDULING FORM

Name ______________________________ Period ___________ TE # ___________

Listed below are 10 possible module workstations. You will spend at least 10 days at each module workstation during the year. Other times during the year you will work individually within small groups or teams to solve problems in the technology education lab. Select the module workstations that you would like for the first five rotations. Rank your choices in order of their importance. List your first five choices in the first column titled "First Choice." Use the second column title "Alternate" to list your five alternate module workstations, and rank them in order of their importance. The third column, "Module Assigned," is for listing your assigned workstations for the first five rotations. I will try to assign your first five rotation choices, but there are others who may have chosen the same workstations. Remember, you will have the opportunity to work in all module workstations.

1. Robotics
2. Electronics
3. CAD
4. Video Production
5. Rocketry/Space
6. CNC Mill/Lathe
7. Engineering
8. Research/Design (CO_2 car)
9. Future Construction
10. Laser/Fiber Optics

First Choice	Alternate	Module Assigned
1.	1.	1.
2.	2.	2.
3.	3.	3.
4.	4.	4.
5.	5.	5.

(Sample Letter for Parents)

(SCHOOL NAME)

TECHNOLOGY EDUCATION LAB

Dear Parent:

Your child is enrolled in the technology education program. The technology education lab provides your child an opportunity to experience many new technologies that affect daily living. The major goals of the technology education lab are to help the student to become more technologically literate and become a productive 21st century citizen. Learning modules are used in the technology lab to allow your child to interact with robots, lasers, computer numerical control (CNC) machines, computer aided drafting (CAD) systems, and other high tech equipment. A self-directed set of instructions is a part of each module. These instructions will explain each activity. Reading is a very important part of technology, and it is also a very important part of this class.

As your child's teacher, I will need your help at home. Please ask your child to share with you what we are doing in class. The students will be completing activities in the following modules:

1. Robotics
2. Electronics
3. CAD
4. Video Production
5. Rocketry/Space
6. CNC Mill/Lathe
7. Engineering
8. Research/Design (CO_2 car)
9. Future Construction
10. Laser/Fiber Optics

The main goal of the technology lab is to create an appropriate teaching/learning environment. Although the facility is unique and the equipment is new and up-to-date, the most important part of this class is your child's attitude and behavior. Your child and only your child, is responsible for his/her behavior. The success of the program depends on how your child acts and reacts to fellow students. A part of your child's overall grade is determined by the work ethic s/he shows every day in the class. Your child will receive 10 points each day s/he is in the module workstation. If your child refuses to work on the assigned module activity, module points are reduced for that day. If your child is placed in the In School Suspension (ISS) behavior program, s/he will not receive any attendance points for that day(s). Your child can receive extra credit points while in ISS. If your child is told to leave the technology lab three times (including times for self and office referrals), I will request a conference with you and your child. Your child cannot participate in the lab until after the conference. Please do not wait to visit the technology lab until there is a discipline problem. You are always welcome to visit the lab. Please check through the main office.

Your child will be evaluated on eight criteria during each module workstation rotation. The criteria are attendance; module activities such as vocabulary, research questions, problem solving abilities, journal entries, and safety practices; and posttest. Your child's progress will be managed with a student record sheet for each module. The student record sheet manages the daily attendance, module points, and posttest. The percentage for each criteria will vary for each module.

Listed below are suggested percentages assigned to each criteria.

Attendance	=	20%
Module Activities	=	30%
Posttest	=	50%

The module activities percentage may include a combination of the following: vocabulary, research questions, problem solving abilities, journal entries, and safety practices.

Your child will have the opportunity to earn extra credit or bonus points. At the end of the nine weeks, the module totals and any extra credit your child has earned is computed. Our school's grading scale will be used to determine the final grade for the period.

If I can be of any service, or if you would like a tour of the technology education lab, please contact me at the school.

Sincerely,

Technology Education Teacher

(Sample Information Sheet for Students)

(SCHOOL NAME)

TECHNOLOGY EDUCATION LAB

Welcome to the technology education lab! The technology lab is designed to allow you to experience many of the new technologies that affect your daily life. The learning modules developed allow you to interact with robots, lasers, computer numerical control (CNC) machines, computer aided drafting (CAD) systems, and other high tech equipment. A self-directed set of instructions is a part of each module. These instructions will explain each activity. Reading is a very important part of technology, and it is also a very important part of this class.

You notice that the lab area is remodeled, and that each module contains new and expensive equipment. We are very proud of our new facility, and we want to keep it looking great and in good repair. You are responsible to do your part in protecting the equipment and to help in the daily room maintenance. Remember that you are working with expensive equipment, and everyone must be careful and observe all safety rules.

The technology lab consists of many module stations, video viewing area, classroom area, research and design area, storage room, and teacher preparation area. A sample of the workstations you may have the opportunity to work with are:

1. Robotics
2. Electronics
3. CAD
4. Video Production
5. Rocketry/Space
6. CNC Mill/Lathe
7. Engineering
8. Research/Design (CO_2 car)
9. Future Construction
10. Laser/Fiber Optics

Many of the activities that you do are self-directed. Other activities will involve small groups or the entire class. I hope that your experiences in this class will be interesting and fun. The activities are designed to help you to understand many new areas of technology.

Classroom Rules

One of the aims of the technology education lab is to provide a relaxed and enjoyable learning environment for all students. Therefore, classroom rules have been kept simple and to a minimum. The rules are constructed to allow all students to maximize their learning. You are responsible for reading, understanding, and following classroom rules. Also, you are to do your part to make this a good learning experience for all students.

Classroom Procedure

Some days the entire class will meet in the classroom area. Other days the class will meet in the lab area. Each day you should enter the technology lab and go directly to your assigned seat or module. An area will be available to store your belongings. I will inform you of the activity planned for that day. Do not take your books and coats with you to the modules. Do not leave valuables or purses unattended. You will be assigned a student notebook that will remain in the technology lab at all times. Pick up your notebook when you enter the technology lab. When the class period is over, return the notebook to its proper location. You are responsible for your **NOTEBOOK AT ALL TIMES**.

Attendance

Attendance in the technology lab is very important. You will be expected to attend all sessions unless you bring an excused note from home or your homeroom teacher. Then you will be given a chance to make up the work. The clock in the technology lab is the official time for class. If you are not in the technology lab when the teacher begins the session, you are late for the session. To participate in the day's activities, you must have an excuse from another teacher or from the main office. Otherwise, you will lose your lab points for that day. On the third tardy, and for every succeeding tardy, disciplinary action will be taken. Promptness is the sign of a good worker, and it is important that you are on time to the technology lab.

Module Information

When you are in the workstation area, you are to stay at your workstation unless I give you permission to go to another area. You will get an opportunity to engage in all module activities. Therefore, you should not leave your station to observe another student's work. If you need help, please raise your hand or turn on the teacher's assistance light.

Most workstations have storage drawers for equipment and other module resources. Please do not open any drawer unless you have received permission from me. In the technology lab, as well as other classes, respect other people's property. If you find something that belongs to someone else, please inform me.

When you enter the workstation, you should check carefully to see if everything is in place and that the equipment has not been damaged. If you find something wrong, let me know immediately. If you wait until after class has started, you will be responsible for any damage that may have been done. Do your part to keep the workstation organized. Remember, if the equipment is damaged, you and future students might miss out on a neat experience. You will receive special instructions on the usage, operation, and safety of the equipment in the lab. Be sure you ask if you have any questions about how to operate any of the equipment.

You will receive a Student Record Form that will have a place for your name and student number. This page will remain in your notebook throughout the quarter. It will be your responsibility to keep track of this page and to return it at the end of the quarter.

Each day you enter the workstation, you should read the instructions for the module activity for that day before you begin the activity. If you have any questions after reading the instructions, please raise your hand or turn on the teacher's assistance light for assistance. You must read and follow the directions each day. At the end of the period I will dismiss you from the technology lab.

Student Equipment

YOU MUST BRING PAPER AND PENCIL TO CLASS EVERY DAY. Some module activities require that you wear safety classes. Safety glasses are provided for you.

Integrated Learning

The integration of other subject areas is a part of the technology lab. You will be challenged to apply the knowledge learned during module activities to other subjects such as math, science, social studies, and English. Other subject teachers are learning what is available in the technology lab and may ask you to discuss some activities in these classes.

Discipline

One of the major concerns when designing and constructing the technology lab was creating an appropriate teaching/learning environment. Although the facility is beautiful and the equipment is new and up-to-date, the most important part of this class is your attitude and behavior. **YOU, AND ONLY YOU, ARE RESPONSIBLE FOR YOUR BEHAVIOR.** The success of the program depends on how you interact with your fellow students. To make the technology lab an enjoyable learning experience for all students, the following procedures have been implemented.

1. You are subjected to the school rules as stated in the student handbook and all safety rules identified for the technology lab. All school rules are enforced!

2. You will be given a Lab Permit. This permit gives you permission to participate in the hands-on portion of the technology lab. You must fill out the permit as directed by your instructor, and this permit is kept in your notebook at all times.

3. You will notice that the Lab Permit has three numbered tabs. Any time that you choose not to follow the rules or the lab procedures, your teacher may remove one of the tabs from your Lab Permit. If you lose a tab, you will sit out one day of the module. If you lose a second tab, you will sit out a second day of the module. Your parent or guardian will be notified that you are in danger of losing your lab privileges. In addition, a referral may be sent to the office or a conference may be held. If you lose all three tabs, you may lose your privilege to work in the technology lab for a period of two weeks. If you lose this privilege, you will be required to complete these two weeks by working from a textbook..

4. SAFETY is our first priority when working in the technology lab. You must never operate equipment in the lab without first being approved for use by your instructor.

Grading System

You will be evaluated on eight criteria during each module workstation rotation. The criteria are attendance; module activities, e.g., vocabulary, research questions, problem solving, journal entries, and safety practices; and posttest. Your progress will be managed with a student record sheet for each module. The student record sheet manages the daily attendance, module points, and posttest. The percentage for each criteria will vary for each module. Listed below are the percentages assigned to each criteria.

Attendance	=	20%
Module Activities	=	30%
Posttest	=	50%

The module activities percentage may include a combination of the following: vocabulary, research questions, problem solving abilities, journal entries, and safety practices.

You will have the opportunity to earn extra credit or bonus points. At the end of the nine weeks, the module totals and any extra credit you have earned are computed. Our school's grading scale will be used to determine the final grade for the period.

BEHAVIOR REQUIREMENTS IN THE TECHNOLOGY LAB

1. **Remain in your module at all times. If you need to ask a question, please raise your hand/turn on call light and wait for the instructor.**

2. **Do not write your points on your student record sheet until you are told to do so.**

3. **If you do not write in your points for the day, both attendance and module, you will receive no points for that day.**

4. **Talking will remain at a low level at all times.**

5. **Deliberate damage to the module or module equipment will result in replacement of materials/equipment by the student or students in the module.**

6. **Items missing from the module at the beginning of the period must be reported to the teacher. Otherwise, the students in the module that period will be responsible for replacing the items.**

7. **Candy, gum, or food items should never be brought into the lab.**

8. **All modules must be clean and everything put in its place before students will be allowed to leave the module.**

9. **Do not sit or write on the module countertops.**

10. **Talking between any two modules is prohibited.**

11. **Do not write or mark on your student notebook, module notebooks, or module reference textbooks.**

12. **Follow all safety rules and procedures for all areas in the technology lab.**

I have read and understand the rules listed above and those listed in this handout. By signing my name below I agree I will abide by all rules listed.

Signature ______________________________

(MODULE TITLE)

STUDENT RECORD SHEET

Name ______________________ Period _________ Module # _________

Attendance

Present - 2 pts/day
Tardy - 1 pt/day
Absent - 0 pt/day

Day	Attendance	Points
1	(P) (T) (A)	_____
2	(P) (T) (A)	_____
3	(P) (T) (A)	_____
4	(P) (T) (A)	_____
5	(P) (T) (A)	_____
6	(P) (T) (A)	_____
7	(P) (T) (A)	_____
8	(P) (T) (A)	_____
9	(P) (T) (A)	_____
10	(P) (T) (A)	_____

Posttest

1. (A) (B) (C) (D)
2. (A) (B) (C) (D)
3. (A) (B) (C) (D)
4. (A) (B) (C) (D)
5. (A) (B) (C) (D)
6. (A) (B) (C) (D)
7. (A) (B) (C) (D)
8. (A) (B) (C) (D)
9. (A) (B) (C) (D)
10. (A) (B) (C) (D)

Module Points

Worksheet (5 pts)	_____
Crossword Puzzle (5 pts)	_____
Vocabulary/Research Ques. (5 pts)	_____
Problem-Solving Abilities (5 pts)	_____
Journal Entries (5 pts)	_____
Safety Practices (5 pts)	_____
TOTAL	_____

Module Totals

Attendance Pts (20 max)	_____
Module Pts (30 max)	_____
Posttest (50 max)	_____
Bonus Pts	_____
TOTAL	_____

SECTION 2

MODULE DEVELOPMENT

Module Development

There are many different formats for modules, just as there are many different teaching styles. Even the best modules may need to be revised to suit an individual instructor's style, time restrictions, and/or lab setup. However, most modules do share similar components. Below is a list of some of the more common components with an example of a heading and text for each.

ACTIVITY OVERVIEW

In today's session, you will see many recent innovations in aviation. You will also read more about the principles of flight and ways of controlling an airplane in flight, as well as the parts of an airplane.

READING ASSIGNMENT

Locate the book entitled (title of book) in your module and read pages (list page numbers).

VIDEO

Locate the video (title of video) and take it to the video viewing area. After watching the video, rewind the tape and return it to your module.

WORKSHEET

Take out your worksheets for this module. Read today's study questions and look for the answers as you complete today's assignment.

ACTIVITY

(Instructor should give instructions for specific activity.)

VOCABULARY

Write the following vocabulary words and their definitions on your module record sheet under "Vocabulary." These definitions will serve as an excellent study guide for your posttest. (list of today's words)

RESEARCH QUESTIONS

Read each question carefully and write the question and correct answer on your module record sheet under "Research." These research questions will be used as a study guide for your posttest. (today's research questions)

SAFETY

(Instructor should list safety instructions for particular activity.)

CROSSWORD

Look over the clues for the crossword puzzle. You will find the answers during the completion of today's assignment.

COMPUTER PROGRAM

(Instructor should provide instructions for use of software.)

INSTRUCTOR CHECK

Make sure that your module is clean and that everything is put in its proper place.

POSTTEST

At your instructor's signal, report to the classroom to take the posttest. Remember, the posttest counts as part of your final grade.

MODULE CHECK-OUT

Today is the final day in this module; make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks out your area.

Module Planning Worksheet

Teacher's Page

Name of Module:

Module Objectives

By the end of this module, the student should be able to:

1.
2.
3.
4.
5.
6.

Basic Skills / Academic Integration

1.
2.
3.
4.

Equipment, Materials, and Supplies

1.
2.
3.
4.
5.
6.

Module Planning Worksheet

Activity Overview

Name of Module:

Day #	Activity Overview
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Module Planning Worksheet

Planning Grid

Name of Module:

Day #	Activities	Instructional Materials	Equipment & Supplies
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Module Planning Worksheet

Day # ____

Name of Module:

Note: All sections not needed every day and order may vary.

Activity Overview:

Reading Assignment:

Video:

Research Questions:

Vocabulary:

Crossword:

Worksheets:

Safety:

Activities:

Computer Program:

Instructor Check:

SECTION 3

MODULAR UTILIZATION OF CURRICULUM GUIDE

MODULAR UTILIZATION OF CURRICULUM GUIDE

COMMUNICATIONS TECHNOLOGY

GRAPHIC COMMUNICATIONS

Explanation of Outline

One of the goals of this outline is to demonstrate to the instructor ways in which topics in the state curriculum guide can be used to construct a ten-day module. Each day of the module outline should contain a topic for that day. This topic should be followed by the reference number of the unit in the curriculum guide which covers that particular topic. The instructor should select reading assignments, computer software, and/or instructional video materials appropriate for that day's topic. The activities found under the sections titled "Core Instructional Activities" and "Advanced Instructional Activities" should be selected to reinforce each day's topic. Activities selected can be adapted to address the instructor's available materials and equipment.

Overview

This outline is intended to provide the instructor with a framework for introducing the student to graphic communications. Since the purpose of this module is to briefly introduce the various areas of graphics to the student, the instructor may wish to construct additional modules on any or all of these areas of graphics.

DAY 1

Topic: Introduction to Graphic Communications
Select activity from Communications Technology Reference 3.0.

DAY 2

Topic: Safety in Graphic Communications
Select activity from Communications Technology Reference 3.1.

DAY 3

Topic: Types of Graphic Communications
Select activity from Communications Technology Reference 3.2.

DAY 4

Topic: Layout and Design
Select activity from Communications Technology Reference 3.3.

DAY 5

Topic: Relief Printing
Select activity from Communications Technology Reference 3.4.

DAY 6

Topic: Gravure Printing
Select activity from Communications Technology Reference 3.5.

DAY 7

Topic: Screen Printing
Select activity from Communications Technology Reference 3.6.

DAY 8

Topic: Planographic Printing
Select activity from Communications Technology Reference 3.7.

DAY 9

Topic: Bindery and Finishing
Select activity from Communications Technology Reference 3.8.

DAY 10

Topic: Posttest

MODULAR UTILIZATION OF CURRICULUM GUIDE

CONSTRUCTION TECHNOLOGY

INTRODUCTION TO CONSTRUCTION TECHNOLOGY

EXPLANATION OF OUTLINE

One of the goals of this outline is to demonstrate to the instructor ways in which topics in the state curriculum guide can be used to construct a ten-day module. Each day of the module outline should contain a topic for that day. This topic should be followed by the reference number of the unit in the curriculum guide which covers that particular topic. The instructor should select reading assignments, computer software, and/or instructional video materials appropriate for that day's topic. The instructor should select reading assignments, computer software, and/or instructional video materials appropriate for the day's topic. Activities found under the sections titled "Core Instructional Activities" and "Advanced Instructional Activities" should be selected to reinforce each day's topic. Activities selected can be adapted to address the instructor's available materials and equipment.

OVERVIEW

This outline is intended to provide the instructor with a framework for introducing construction technology, showing how construction is managed, and exploring the future of construction technology. Since the major purpose of this module is to briefly introduce the student to construction, the instructor is encouraged to construct additional modules on specific areas of construction technology.

DAY 1

Topic: Introduction to Construction Technology
Select reading assignment or video presentation based on availability.

DAY 2

Topic: Products of Construction
Select activity from Construction Technology Reference 1.1.

DAY 3

Topic: Impacts of Construction
Select activity from Construction Technology Reference 1.2.

DAYS 4 & 5

Topic: Planning Construction
Select activity from Construction Technology Reference 2.1.

DAY 6

Topic: Organizing Construction
Select activity from Construction Technology Reference 2.2.

DAY 7

Topic: Managing Construction
Select activity from Construction Technology Reference 2.3.

DAYS 8 & 9

Topic: Future of Construction
Select activity from Construction Technology Reference 13.1.

DAY 10

Topic: Posttest

MODULAR UTILIZATION OF CURRICULUM GUIDE

ENERGY, POWER AND TRANSPORTATION TECHNOLOGY

ROBOTICS

EXPLANATION OF OUTLINE

One of the goals of this outline is to demonstrate to the instructor ways in which topics in the state curriculum guide can be used to construct a ten-day module. Each day of the module outline should contain a topic for that day. This topic should be followed by the reference number of the unit in the curriculum guide which covers that particular topic. The instructor should select reading assignments, computer software, and/or instructional video materials appropriate for that day's topic. Activities found under the sections titled "Core Instructional Activities" and "Advanced Instructional Activities" should be selected to reinforce each day's topic. Activities selected can be adapted to address the instructor's available materials and equipment.

OVERVIEW

This outline is intended to provide the instructor with a framework for introducing the student to the basics of fluid power systems through the design and construction of a simple robotic arm. Since the purpose of this module is to briefly introduce the student to the basics of fluid power systems, the instructor is encouraged to construct additional modules on specific areas of Energy, Power and Transportation.

DAY 1

Topic: Introduction to Fluid Power Systems (parts, types, and theory of operation)
Select reading assignment and/or video presentation from Energy, Power and Transportation Technology Reference 3.2.

DAY 2

Topic: Everyday Uses of Fluid Power
Select an activity from Energy, Power and Transportation Technology Reference 3.2.

DAY 3

Topic: History and Basic Operating Principles of Robots
Select a reading assignment and/or video presentation based on Energy, Power and Transportation Technology Reference 3.5.

DAY 4

Topic: Schematic Design of Fluid Power Systems
Select an activity from Energy, Power and Transportation Technology Reference 3.2.

DAY 5

Topic: Design and Build a Robot Arm
Select an activity from Energy, Power and Transportation Technology Reference 3.2.

DAY 6

Topic: Design and Build a Robot Arm
Select an activity from Energy, Power and Transportation Technology Reference 3.2.

DAY 7

Topic: Design and Build a Robot Arm
Select an activity from Energy, Power and Transportation Technology Reference 3.2.

DAY 8

Topic: Design and Build a Robot Arm
Select an activity from Energy, Power and Transportation Technology Reference 3.2.

DAY 9

Topic: Design and Build a Robot Arm
Select an activity from Energy, Power and Transportation Technology Reference 3.2.

DAY 10

Topic: Posttest

MODULAR UTILIZATION OF CURRICULUM GUIDE

MANUFACTURING TECHNOLOGY

MATERIALS AND PROCESSES

EXPLANATION OF OUTLINE

One of the goals of this outline is to demonstrate to the instructor ways in which topics in the state curriculum guide can be used to construct a ten-day module. Each day of the module outline should contain a topic for that day. This topic should be followed by the reference number of the unit in the curriculum guide which covers that particular topic. The instructor should select reading assignments, computer software, and/or instructional video materials appropriate for that day's topic. Activities found under the sections titled "Core Instructional Activities" and "Advanced Instructional Activities" should be selected to reinforce each day's topic. Activities selected can be adapted to address the instructor's available materials and equipment.

OVERVIEW

This outline is intended to provide the instructor with a framework for introducing the student to different materials and processes. Since the purpose of this module is to briefly introduce these processes to the student, the instructor may wish to construct additional modules on any or all of these individual processes.

DAY 1

Topic: Introduction to Materials and Processes
Select reading assignment or video presentation based on availability.

DAY 2

Topic: Separation by Chip Removal
Select activity from Manufacturing Technology Reference 3.3.

DAY 3

Topic: Shearing
Select activity from Manufacturing Technology Reference 3.4.

DAY 4

Topic: Separation by Other Processes
Select activity from Manufacturing Technology Reference 3.5.

DAY 5

Topic: Casting and Molding
Select activity from Manufacturing Technology Reference 3.6.

DAY 6

Topic: Forming
Select activity from Manufacturing Technology Reference 3.7.

DAY 7

Topic: Conditioning
Select activity from Manufacturing Technology Reference 3.8.

DAY 8

Topic: Combining
Select activity from Manufacturing Technology Reference 3.9.

DAY 9

Topic: Coating
Select activity from Manufacturing Technology Reference 3.10.

DAY 10

Topic: Posttest

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SECTION 4

SAMPLE MODULES
(GRANT EQUIPMENT)

COMMUNICATION TECHNOLOGY

VIDEO PRODUCTION

INTRODUCTION

Communications is one of the most challenging areas of technology. Communications is the sending and receiving of a message. The television is one of the most widely used communications systems today. During the next ten days, you will be exploring video production. You will also operate a camcorder, write a script, and use computer software to enhance your video commercial.

OBJECTIVES

1. Identify agencies that control the broadcasting industry.
2. Explore the role networks play in the broadcasting industry.
3. Write a script for a video commercial.
4. Prepare a storyboard for the video commercial.
5. Prepare an introduction to your video commercial utilizing the VCR Companion computer program.
6. Design a set for the video commercial.
7. Produce a video commercial.
8. Edit a video commercial.
9. Identify job opportunities in the broadcasting industry.
10. Identify and use audio/video equipment.

BASIC SKILLS / ACADEMIC INTEGRATION

1. Communication skills are reinforced through writing script as well as acting out the commercial.
2. Computer skills are reinforced through use of computer to add beginning to commercial.

EQUIPMENT / SUPPLIES / MATERIALS

1. Camcorder
2. Monitor
3. Computer
4. Software
5. Videocassette recorder
6. VHS tapes
7. Computer disks

COMMUNICATION TECHNOLOGY

VIDEO PRODUCTION

DAY 1

ACTIVITY OVERVIEW

Today you will identify agencies that control the broadcasting industry and explain the role networks play in the broadcasting industry.

READING ASSIGNMENT

Locate the book entitled (title of book) in your module and read pages (list page numbers).

*Instructor's note: Because most instructors have access to a variety of texts, the instructor should select a book that explains the broadcasting industry.

CROSSWORD PUZZLE

Obtain a crossword puzzle. You will find the answers to this puzzle from the reading that you have just completed. Read over the clues so that you will recognize them when you find the answers.

*Instructor's note: The instructor should select vocabulary words from reading assignment and make a crossword puzzle.

ACTIVITY

Locate the four major networks' emblems and slogans in your module. Analyze each network and determine how the network encourages viewers to watch its programs. Write a brief description of the four major networks on your worksheet labeled "Networks."

*Instructor's note: The instructor should provide photos, diagrams, or a video of each network.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

COMMUNICATION TECHNOLOGY

VIDEO PRODUCTION

DAY 2

ACTIVITY OVERVIEW

Today you will write a script for your commercial.

READING ASSIGNMENT

Locate the book entitled (title of book) in your module and read pages (list page numbers).

*Instructor's note: Because most instructors have access to a variety of texts, the instructor should select a book that explains how to write a script.

VIDEO

Locate the videotape on commercials. Follow instructions for using the VCR and watch the video. Pay special attention to the way the commercials are sequenced and also the time span (15-25 seconds) of each commercial.

*Instructor's note: The instructor should make a video of commercials to enhance student's knowledge of commercials.

ACTIVITY

By now you should have some idea of what you want your commercial to be about. If you are still unsure, refer to the list of topics provided. Obtain a script worksheet and fill in the information about your commercial.

*Instructor's note: Provide topics for student to select a commercial idea.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

COMMUNICATION TECHNOLOGY

VIDEO PRODUCTION

DAY 3

ACTIVITY OVERVIEW

Today you will learn how to use the VCR Companion software to enhance your video commercial.

COMPUTER PROGRAM

Obtain the VCR Companion software and a data disk. Follow proper procedures when using the computer.

WORKSHEET

After you have booted the software, obtain a checklist. Use the checklist to make sure you are using the software correctly.

*Instructor's note: The instructor should provide a checklist to assist the student with the computer program.

ACTIVITY

Make sure you have completed all items on the checklist. Save your work on a data disk. Note: Do not remove disk or turn off computer before you save your work. Otherwise, you will have to begin your opening title footage for your commercial all over again.

*Instructor's note: The instructor should assist the student in saving the work to a data disk.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

COMMUNICATION TECHNOLOGY

VIDEO PRODUCTION

DAY 4

ACTIVITY OVERVIEW

Today you will prepare a storyboard for your written script.

READING ASSIGNMENT

Locate the book entitled (title of book) in your module and read pages (list page numbers).

*Instructor's note: Because most instructors have access to a variety of texts, the instructor should select a book that explains how to assemble a storyboard.

WORKSHEET

Obtain storyboard worksheets. Begin drawing and labeling your written script into the storyboard format on the worksheet. Use as many worksheets as you need in order to get your point across on paper.

*Instructor's note: The instructor should provide a storyboard worksheet similar to the storyboard in the reading assignment.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

ACTIVITY OVERVIEW

Today you will design a set for your commercial. You will also write cue cards for your commercial.

ACTIVITY

Props and background are very important in video production. Look around the classroom and find a suitable place for your production. If you need to go outdoors or to another part of the school, ask for permission first.

WORKSHEET

Obtain a video set and design worksheet. Be sure to list your props!

READING ASSIGNMENT

Locate the book entitled (<u>title of book</u>) in your module and read pages (list page numbers).

*Instructor's note: Because most instructors have access to a variety of texts, the instructor should select a book that explains video instructions.

ACTIVITY

Obtain the cue cards. Copy everything from your storyboard onto your cue cards. Be sure to label your video instructions on your cue cards. This will help you when you begin production.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

COMMUNICATION TECHNOLOGY

VIDEO PRODUCTION

DAY 6

ACTIVITY OVERVIEW

Today you will begin production of your video commercial. At this point in the module, it's time to make sure you have everything you need in order to start production.

Check to make sure you have the following items completed.

1. written script
2. storyboard
3. cue card
4. video set and design worksheet
5. VCR Companion data disk

ACTIVITY

Obtain a VHS tape. Place it into the camcorder following instructions provided. Practice recording subjects by taping your classmates working in the other modules. You do not have to leave your module at this time; instead, practice video instructions within your module to make sure you can use the camera correctly.

VIDEO

Have your instructor set up a TV and VCR for you to review your tape.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

COMMUNICATION TECHNOLOGY

VIDEO PRODUCTION

DAY 7

ACTIVITY OVERVIEW

Today you will record your commercial and begin editing.

ACTIVITY

Recording of your video is very important. Be sure that you have all your props and that your set is free of noise or distractions from others. You are the STAR!!--either in front of the camera or as the operator. Give it your best shot. Good Luck with your effort!!

ACTIVITY

Now you are ready to edit. Review your video and record again if necessary. Your instructor will assist you in reviewing your video.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

COMMUNICATION TECHNOLOGY

VIDEO PRODUCTION

DAY 8

ACTIVITY OVERVIEW

Today you will edit your video and insert your introduction from the VCR Companion software.

VIDEO

Take time now to really concentrate on your video. Ask yourself the following questions as you preview your effort. Was the camera shaking as I did a pan, close-up, etc.? If you need to record again, go for it!

Instructor's note: The instructor may wish to preview video beforehand to assist student in answering questions.

COMPUTER PROGRAM

Obtain data disk of opening title footage for the video commercial. Set up the computer and the camcorder to begin editing.

ACTIVITY

Editing requires patience and time. Don't rush this part or all of your efforts will be erased. Have your instructor check your setup for editing. Practice editing your opening title footage and your actual camcorder footage. Make sure your timing is right by using the tape counter or a stopwatch.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

COMMUNICATION TECHNOLOGY

VIDEO PRODUCTION

DAY 9

ACTIVITY OVERVIEW

Today you will explore careers in the broadcasting industry. You will also continue editing your video commercial.

READING ASSIGNMENT

Locate the book entitled (title of book) in your module and read pages (list page numbers).

*Instructor's note: Because most instructors have access to a variety of texts, the instructor should select a book that explores careers in the broadcasting industry.

CROSSWORD PUZZLE

Obtain a crossword puzzle. You will find the answers to this puzzle from the reading you have just completed. Read over the clues so that you will recognize them when you find the answers.

*Instructor's note: The instructor should select vocabulary words from reading assignment and make a crossword puzzle.

ACTIVITY

Set up the equipment just like you had it on Day 8. Make sure that your timing is correct. Ask the instructor to check your setup. Begin editing the final product.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

COMMUNICATION TECHNOLOGY

VIDEO PRODUCTION

DAY 10

ACTIVITY OVERVIEW

Today is the final day in this module. You will be given a test to determine how much you have learned.

POSTTEST

Take about 10 to 15 minutes to look over your crossword puzzle and worksheets. At your instructor's signal, report to the classroom to take the posttest. Remember, the posttest counts as part of your final grade.

MODULE CHECKOUT

Today is the final day in this module; make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until the instructor checks your area.

CONSTRUCTION TECHNOLOGY

FRAMING STRUCTURES

INTRODUCTION

Construction is a major part of technology. Construction is the assembly of structures that cannot be easily moved once completed. Framing structures are made from wood, reinforced concrete, and steel. The frame supports the roof, ceiling, and the floors of a structure. During the next ten days, you will be exploring framing structures. You will design and construct a prototypical wall frame.

OBJECTIVES

1. Identify various types of framing structures.
2. Describe the function of framing in a structure.
3. List the procedures for layout and construction of a wall frame.
4. Design and construct a prototypical wall frame.

BASIC SKILLS / ACADEMIC INTEGRATION

1. Measurement skills are reinforced through the use of various measuring devices.
2. Communication skills are reinforced by designing wall frames.

EQUIPMENT / SUPPLIES / MATERIALS

1. Architect's scale
2. Grid paper
3. Drawing board, T-square, triangles
4. Hammer
5. Dovetail saw
6. Brads, small nails, or glue
7. Balsa wood or any modeling wood

CONSTRUCTION TECHNOLOGY

FRAMING STRUCTURES

DAY 1

ACTIVITY OVERVIEW

Today you will learn about the history of construction.

READING ASSIGNMENT

Locate the book entitled (title of book) in your module and read pages (list page numbers).

Instructor's note: Because most instructors have access to a variety of texts, the instructor should select a book that explains the history of construction.

VOCABULARY

List and define the following terms on your vocabulary worksheet. (list of terms from reading assignment)

*Instructor's note: The instructor should select several vocabulary words from the chosen reading assignment.

RESEARCH QUESTIONS

Answer the following questions on your research questions worksheet. (list of questions from reading assignment)

*Instructor's note: The instructor should select several research questions from the chosen reading assignment.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until the instructor checks today's assignment.

CONSTRUCTION TECHNOLOGY

FRAMING STRUCTURES

DAY 2

ACTIVITY OVERVIEW

Today you will discover various framing techniques.

VIDEO

Locate the video on framing techniques.

*Instructor's note: Many videos are available on framing techniques. If one cannot be located, the instructor can record a video of local construction sites.

RESEARCH QUESTIONS

Answer the following questions on your research questions worksheet. (list of questions from video)

*Instructor's note: The instructor should select several research questions from the video.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until the instructor checks today's assignment.

CONSTRUCTION TECHNOLOGY

FRAMING STRUCTURES

DAY 3

ACTIVITY OVERVIEW

Today you will identify and describe the functions of wall frames in a structure.

READING ASSIGNMENT

Locate the book entitled (title of book) in your module and read pages (list page numbers).

*Instructor's note: Because most instructors have access to a variety of texts, the instructor should select a book that describes wall frames.

VOCABULARY

List and define the following terms on your vocabulary worksheet. (list of terms from reading assignment)

*Instructor's note: The instructor should select several vocabulary words from the chosen reading assignment.

RESEARCH QUESTIONS

Answer the following questions on your research questions worksheet. (list of questions from reading assignment)

*Instructor's note: The instructor should select several research questions from the chosen reading assignment.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until the instructor checks today's assignment.

CONSTRUCTION TECHNOLOGY

FRAMING STRUCTURES

DAY 4

ACTIVITY OVERVIEW

Today you will identify how a wall structure is constructed.

VIDEO

Locate the video on wall structures.

*Instructor's note: Many videos are available on wall structures. If one cannot be located, the instructor can record a video of a local construction company making a wall structure.

RESEARCH QUESTIONS

Answer the following questions on your research questions worksheet. (list of questions from video)

*Instructor's note: The instructor should select several research questions from the video.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until the instructor checks today's assignment.

CONSTRUCTION TECHNOLOGY

FRAMING STRUCTURES

DAY 5

ACTIVITY OVERVIEW

Today you will identify basic techniques used by the drafting industry.

READING ASSIGNMENT

Locate the book entitled (title of book) in your module and read pages (list page numbers).

*Instructor's note: Because most instructors have access to a variety of texts, the instructor should select a book that explains techniques used by the drafting industry.

VOCABULARY

List and define the following terms on your vocabulary worksheet. (list of terms from reading assignment)

*Instructor's note: The instructor should select several vocabulary words from the chosen reading assignment.

RESEARCH QUESTIONS

Answer the following questions on your research questions worksheet. (list of questions from reading assignment)

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until the instructor checks today's assignment.

FRAMING STRUCTURES

DAY 6

ACTIVITY OVERVIEW

Today you will sketch a wall section.

READING ASSIGNMENT

Locate the book entitled (title of book) in your module and read pages (list page numbers).

*Instructor's note: Because most instructors have access to a variety of texts, the instructor should select a book that explains sketching techniques.

VOCABULARY

List and define the following terms on your vocabulary worksheet. (list of terms from reading assignment)

*Instructor's note: The instructor should select several vocabulary words from the chosen reading assignment.

RESEARCH QUESTIONS

Answer the following questions on your research questions worksheet. (list of questions from reading assignment)

*Instructor's note: The instructor should select several research questions from the chosen reading assignment.

ACTIVITY

Each student should make 3 thumbnail sketches of a wall section. After examining all the sketches, the student should select one sketch to design the prototypical wall frame.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until the instructor checks today's assignment.

CONSTRUCTION TECHNOLOGY

FRAMING STRUCTURES

DAY 7

ACTIVITY OVERVIEW

Today you will design a wall section.

READING ASSIGNMENT

Locate the book entitled (title of book) in your module and read pages (list page numbers).

*Instructor's note: Because most instructors have access to a variety of texts, the instructor should select a book that explains design techniques.

VOCABULARY

List and define the following terms on your vocabulary worksheet. (list of terms from reading assignment)

*Instructor's note: The instructor should select several vocabulary words from the chosen reading assignment.

ACTIVITY

1. Review drafting techniques from Day 5.
2. Design a framed wall section using the sketch completed on Day 6.
3. Using grid paper and drafting equipment, draw a framed wall section.
4. The framed wall section should be 8' tall and 16' long.
5. Use the 1/2" scale = 1' to draw the framed wall section.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until the instructor checks today's assignment.

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CONSTRUCTION TECHNOLOGY

FRAMING STRUCTURES

DAY 8

ACTIVITY OVERVIEW

Today you will begin construction of a framed wall section.

ACTIVITY

1. Refer to your design of a framed wall section from Day 7.
2. Obtain the wood and the dovetail saw from your instructor.

SAFETY

Use care when working with the wood and the dovetail saw. Check the wood for loose splinters, and always cut the wood away from your body.

ACTIVITY

1. Measure the wood for the length of the wall section.
2. Cut all of the long pieces first, and label.
3. Measure the wood for the remainder of the wall section.
4. Cut the remaining pieces of the wall section, and label.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until the instructor checks today's assignment.

CONSTRUCTION TECHNOLOGY

FRAMING STRUCTURES

DAY 9

ACTIVITY OVERVIEW

Today you will complete construction of a framed wall section.

ACTIVITY

1. Refer to your design of a framed wall section from Day 7.
2. Make final cuts and label each piece.
3. Begin assembly of the framed wall section.
4. Check diagonal measurements of the framed wall section to ensure that the wall is square.
5. Use glue or nails to fasten the pieces of the framed wall section.

SAFETY

Use care when working with the wood and the dovetail saw. Check the wood for loose splinters, and always cut the wood away from your body. Exercise caution when using the hammer. Position hand so you will strike the nail and not your fingers!

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module is clean. Stay in your module until the instructor checks today's assignment.

CONSTRUCTION TECHNOLOGY

FRAMING STRUCTURES

DAY 10

ACTIVITY OVERVIEW

Today is the final day in this module. You will be given a test to determine how much you have learned.

POSTTEST

Take about 10 to 15 minutes to look over your crossword puzzle and worksheets. At your instructor's signal, report to the classroom to take the posttest. Remember, the posttest counts as part of your final grade.

MODULE CHECKOUT

Today is the final day in this module; make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until the instructor checks your area.

ENERGY, POWER AND TRANSPORTATION TECHNOLOGY

AUTOMOTIVE FUNDAMENTALS

INTRODUCTION

The use of the Ground Transportation trainer will provide an excellent introduction to the fundamentals of the automobile. This module is designed to provide you with hands-on learning experiences, as well as provide a technical insight into the various parts of the modern automobile. During the next ten days you will explore the various components of the automobile. You will perform many of the more common repairs and adjustments necessary on today's modern automobiles.

OBJECTIVES

By the end of this module, the student will be able to:

1. List the major components of a modern automobile.
2. Make adjustments to various components (wheel alignment, brakes, etc.).
3. Identify the external parts of a small gasoline engine.
4. Perform normal vehicle maintenance, including tire pressure, oil and gas levels, and brake fluid levels.
5. Demonstrate safe driving habits.

BASIC SKILLS / ACADEMIC INTEGRATION

1. Math skills are reinforced through calculations and adjustments.
2. Language arts skills are reinforced while reading and following procedures.

EQUIPMENT / SUPPLIES / MATERIALS

1. Ground Transportation Trainer
2. Ground Transportation Trainer Manual
3. Automotive fundamentals module guide
4. Basic set of automotive hand tools
5. Gasoline, oil, and brake fluid

ENERGY, POWER AND TRANSPORTATION TECHNOLOGY

AUTOMOTIVE FUNDAMENTALS

DAY 1

ACTIVITY OVERVIEW

In this module, you will be introduced to the fundamentals of the automobile through the use of the Ground Transportation Technology trainer. The activities are designed to give you hands-on learning experiences, as well as provide you with an insight into the various parts of the modern automobile.

INFORMATION

Please note that all the information in the trainer lessons refers to rear drive automobiles.

READING ASSIGNMENT

Find the user's manual for your transportation trainer and read Lesson 1 (wheels, tires, and hubs) and Lesson 2 (wheel bearings).

ASSIGNMENT

Perform the procedures outlined in Lessons 1 and 2.

NOTES:

1. Do not overtighten the lug nuts; this can strip the threads.
2. Do not put the wheels back on at the end of Lesson 1; go right on to Lesson 2.
3. When you put the cotter pins back into the spindles, do not bend over the end as you would normally do.
4. When you replace the metal cap on the spindle, tap it into place with a wooden or rubber mallet.

RESEARCH QUESTIONS

Read each question carefully, and write the questions and correct answers on your module record sheet. These questions will be used as a study guide for your posttest.

1. The tie rods are connected to the steering rack with ____________.
2. We need to adjust the toe-in and toe-out on a car to prevent ____________.
3. Negative camber allows tires to have ____________ when turning a corner.

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4. We need to bleed the brakes to remove the ____________ from the lines.

5. The rear wheels are allowed to move ____________ during a turn when a differential is used.

VOCABULARY WORDS

Write the following vocabulary words and their definitions on your module record sheet. This will serve as an excellent study guide for your posttest on this module.

1. Grease
2. Hydraulic Fluid
3. Caliper
4. Differential
5. Muffler

MODULE CHECKOUT

Make sure that your module is clean and that everything is put in its proper place.

ENERGY, POWER AND TRANSPORTATION TECHNOLOGY

AUTOMOTIVE FUNDAMENTALS

DAY 2

ACTIVITY OVERVIEW

In today's session you will learn about rack and pinion steering and how steering operates. You will also learn about wheel alignment and how to set toe-in and toe-out.

READING ASSIGNMENT

Find the user's manual for your transportation trainer, and read Lesson 3 (steering) and Lesson 4 (wheel alignment).

ASSIGNMENT

Perform the procedures outlined in Lessons 3 and 4.

NOTES:

1. Do not replace the bolts in the steering rack and tie rod, but go right on to Procedure 4.
2. Work carefully and <u>do</u> <u>not</u> overtighten any of the nuts and bolts.

MODULE CHECKOUT

Make sure that your module is clean and that everything is put in its proper place.

AUTOMOTIVE FUNDAMENTALS

DAY 3

ACTIVITY OVERVIEW

In today's session you will learn more about wheel alignment and how to set the front end camber.

READING ASSIGNMENT

Find the user's manual for your transportation trainer, and read Lesson 5 (wheel alignment).

ASSIGNMENT

Perform the procedures outlined in Lesson 5.

MODULE CHECKOUT

Make sure that your module is clean and that everything is put in its proper place.

AUTOMOTIVE FUNDAMENTALS

DAY 4

CHECKUP

Open your notebook and have all of your record sheets and worksheets out on top of your module. Your instructor will come and check your work. <u>Do not go on with your activities until your instructor has checked your work</u>.

ACTIVITY OVERVIEW

In today's session you will learn the principle of shock absorbers and how to remove them. You will also learn about disc brakes, how the calipers work, and friction and heat transfer.

READING ASSIGNMENT

Find the user's manual for your transportation trainer, and read Lesson 6 (shock absorbers) and Lesson 7 (brakes).

ASSIGNMENT

Perform the procedures outlined in Lessons 6 and 7.

NOTES:
1. When you take something apart, be careful not to lose any parts.
2. When you take something apart, pay particular attention to how the parts were assembled originally.

RESEARCH QUESTIONS

Read each question carefully, and write the question and correct answer on your module record sheet. These research questions will be used as a study guide for your posttest.

6. Spark plugs are used to ___________ the fuel/air mixture.

7. If you are not careful removing the spark plug, you might crack the porcelain. True or False?

8. Temperatures inside an engine can reach a maximum of ___________ degrees.

9. When we first start to align the front end of a vehicle, we must make sure the front wheels are parallel to the back wheels. True or False?

10. The rear wheels of our vehicle have 2 deg. of camber. True or False?

VOCABULARY WORDS

Write the following vocabulary words and their definitions on your module record sheet. This will serve as an excellent study guide for your posttest on this module.

6. Gap
7. Camber
8. Carburetor
9. Choke
10. Feeler

MODULE CHECKOUT

Make sure that your module is clean and that everything is in its proper place.

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ENERGY, POWER AND TRANSPORTATION TECHNOLOGY

AUTOMOTIVE FUNDAMENTALS

DAY 5

ACTIVITY OVERVIEW

In today's session you will learn why brakes are operated hydraulically and how to bleed a brake system.

READING ASSIGNMENT

Find the user's manual for your transportation trainer, and read Lesson 8 (brakes).

ASSIGNMENT

Perform the procedure outlined in Lesson 8.

NOTE:
1. Read and follow directions carefully.
2. The container for bleeding the brake fluid must be very clean!
3. When the procedure tells you to push the vehicle to check the brakes, leave the vehicle on the stand, and turn the wheel by hand.

CLEANUP

Make sure that your module is clean and that everything is put in its proper place.

ENERGY, POWER AND TRANSPORTATION TECHNOLOGY

AUTOMOTIVE FUNDAMENTALS

DAY 6

ACTIVITY OVERVIEW

In today's session you will learn about differential and reduction action and perform rolling experiments to explain planetary gears and sprocket reduction.

READING ASSIGNMENT

Find the user's manual for your transportation trainer, and read Lesson 9 (differential).

ASSIGNMENT

Perform the procedures outlined in Lesson 9.
NOTE: Put the results of the two procedures in your journal.

MODULE CHECKOUT

Make sure that your module is clean and that everything is put in its proper place.

ENERGY, POWER AND TRANSPORTATION TECHNOLOGY

AUTOMOTIVE FUNDAMENTALS

DAY 7

ACTIVITY OVERVIEW

In today's session you will learn about small gasoline engines. You will learn the different parts of a small gas engine and what they do. You will also learn to remove, clean, and gap spark plugs.

READING ASSIGNMENT

Find the user's manual for your transportation trainer, and read Lessons 10 (small engine parts) and 11 (small engine spark plugs).

ASSIGNMENT

Perform the procedures outlined in Lessons 10 and 11.
NOTE: When the procedure on page 11-1 calls for you to remove the spark plug, be careful and check to see that the engine is not hot.

MODULE CHECKOUT

Make sure that your module is clean and that everything is put in its proper place.

ENERGY, POWER AND TRANSPORTATION TECHNOLOGY

AUTOMOTIVE FUNDAMENTALS

DAY 8

ACTIVITY OVERVIEW

In today's session you will learn about heat transfer and engine cooling. You will also learn to perform basic vehicle maintenance.

READING ASSIGNMENT

Find the user's manual for your transportation trainer, and read Lessons 12 (small engines) and 13 (vehicle maintenance).

ASSIGNMENT

Perform the procedures outlined in Lessons 12 and 13.

MODULE CHECKOUT

Make sure that your module is clean and that everything is put in its proper place.

ENERGY, POWER AND TRANSPORTATION TECHNOLOGY

AUTOMOTIVE FUNDAMENTALS

DAY 9

ACTIVITY OVERVIEW

In today's session you will get to take the trainer on the road.

READING ASSIGNMENT

Find the user's manual for your transportation trainer, and read Lesson 14 (driving).

ASSIGNMENT

Perform the procedure outlined in Lesson 14.

NOTES:
1. Fill out the driver's test form found in your module.
2. Do not leave the parking lot behind the lab.
3. While one person is driving the vehicle, his/her partner should be on the lookout for moving vehicles.
4. If you take the vehicle out of the designated driving area (parking lot behind lab) you will lose all module points for the activity.

MODULE REVIEW

This is the last day in this module. You will be given a posttest for this module in the next session. If you have time left in this session, review all that you have learned and be prepared for the next session.

MODULE CHECKOUT

Make sure that your module is especially clean today. You will not be allowed to leave until your module is in exact order. Wipe off all surfaces, and make sure that everything is returned to its proper place. When you have finished your cleanup, sit quietly until your instructor checks your module. Good luck on the posttest!

ENERGY, POWER AND TRANSPORTATION TECHNOLOGY

AUTOMOTIVE FUNDAMENTALS

DAY 10

ACTIVITY OVERVIEW

Today is the final day in this module. You will be given a test to determine how much you have learned.

POSTTEST

Take about 10 to 15 minutes to look over your crossword puzzle and worksheets. At your instructor's signal, report to the classroom to take the posttest. Remember, the posttest counts as part of your final grade.

MODULE CHECKOUT

Today is the final day in this module; make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until the instructor checks your area.

MANUFACTURING TECHNOLOGY

PLASTICS

INTRODUCTION

During the next ten days, you will be producing a number of plastic products. Some of the equipment that you will be using includes an injection molder, a thermoforming molder, and a rotational molder. Plastics are cheap and easily formed. Many parts that were once made of metal and wood are now made of plastics. Plastics come in many different forms, such as sheets, foam, pellets, and liquid.

MODULE OBJECTIVES

By the end of this module, the student should be able to:

1. Describe how the plastics industry developed.
2. List some of the many uses of plastics in industry.
3. Safely produce products using an injection molder.
4. Safely produce products using a rotational molder.
5. Safely produce products using a thermoforming molder.
6. Discuss the environmental aspects of the plastics industry.

BASIC SKILLS / ACADEMIC INTEGRATION

1. Industrial technology and social studies classes are encouraged to work together in determining the environmental impacts of the plastics industry. These classes should discuss what restrictions, if any, should be placed upon the manufacture and use of plastics.

EQUIPMENT / SUPPLIES / MATERIALS

<u>Equipment</u>
Injection molder with various molds.
Rotational molder with various molds.
Thermoforming molder with various molds.

<u>Supplies</u>
Plastic for each of the pieces of equipment listed above.

<u>Materials</u>
Video - Selected by teacher to introduce student to plastics technology.

Books - Baird, Ronald J., and David T. Baird, <u>Industrial Plastics</u>, South Holland, Ill.: Goodheart-Willcox, 1986.
Owners' manuals for above listed equipment.

MANUFACTURING TECHNOLOGY

PLASTICS

DAY 1

ACTIVITY OVERVIEW

Today you will learn about the plastics industry and how many of the products are manufactured.

WORKSHEET

Take out your worksheets for this module. Read today's study questions, and look for the answers as you complete today's assignment. Your instructor will check your answers at the end of the class and give you credit accordingly.

VIDEO

Locate the video "(title of video)," and take it to the video viewing area. After watching the video, rewind the tape, and return it to your module.

*Instructor's note: There are a number of videos available about the plastics industry. Based on availability, the instructor should select a video that introduces the student to plastics technology.

READING ASSIGNMENT

Locate the book entitled Industrial Plastics in your module and read pages 7-13.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

MANUFACTURING TECHNOLOGY

PLASTICS

DAY 2

ACTIVITY OVERVIEW

Today you will learn about the injection molder. Many products are manufactured using an injection molder. Combs, plastic spoons and forks, and checkers are just a few of the items made using this process.

WORKSHEET

Take out your worksheets for this module. Read today's study questions, and look for the answers as you complete today's assignment. Your instructor will check your answers at the end of the class and give you credit accordingly.

READING ASSIGNMENT

Locate the book entitled Industrial Plastics in your module, and read pages 84-98.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

MANUFACTURING TECHNOLOGY

PLASTICS

DAY 3

ACTIVITY OVERVIEW

Today you will learn about the safety rules and operating procedures for the injection molder.

SAFETY

1. NEVER place the spoon or any metal object in the area behind the thermostat knob. This area contains electrical connections for the unit, and a metal object can short-circuit the equipment and cause serious injury to the operator.

2. Do not press the handle down until the machine is up to operating temperature.

3. Should the handle be frozen in the down position because the heat was turned off with the ram in the cylinder, do not force it open, but reheat the cylinder until the ram and handle move easily.

4. Always allow about 5 minutes for the injection molder to reach operating temperature.

5. Never press the handle down unless there is a mold clamped in the vise.

6. Always leave a mold in the vise to protect the support arms in case of accidental movement of the handle when the machine is cold.

ACTIVITY

*Instructor's note: Because of differences in equipment, the instructor should provide step-by-step instructions for the safe operation of the particular injection molder.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

MANUFACTURING TECHNOLOGY

PLASTICS

DAY 4

ACTIVITY OVERVIEW

Today you will continue to work with the injection molder.

SAFETY

1. NEVER place the spoon or any metal object in the area behind the thermostat knob. This area contains electrical connections for the unit, and a metal object can short-circuit the equipment and cause serious injury to the operator.

2. Do not press the handle down until the machine is up to operating temperature.

3. Should the handle be frozen in the down position because the heat was turned off with the ram in the cylinder, do not force it open, but reheat the cylinder until the ram and handle move easily.

4. Always allow about 5 minutes for the injection molder to reach operating temperature.

5. Never press the handle down unless there is a mold clamped in the vise.

6. Always leave a mold in the vise to protect the support arms in case of accidental movement of the handle when the machine is cold.

ACTIVITY

After reviewing the instructions from Day 4, continue working with the injection molder. Today will be your last day working with the injection molder.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

MANUFACTURING TECHNOLOGY

PLASTICS

DAY 5

ACTIVITY OVERVIEW

Today you will learn about the uses and operation of the rotational molder.

WORKSHEET

Take out your worksheets for this module. Read today's study questions, and look for the answers as you complete today's assignment. Your instructor will check your answers at the end of the class and give you credit accordingly.

READING ASSIGNMENT

Locate the book entitled Industrial Plastics in your module, and read pages 143-148.

SAFETY

The oven and the molds get extremely hot. DO NOT ATTEMPT TO HANDLE THE HEATED MOLDS WITHOUT THE PROTECTIVE MITTENS.

ACTIVITY

Tomorrow you will begin to work with the rotational molder. The process of rotational molding takes almost the entire class period; therefore, you should become familiar with the operating instructions by the end of today's class so that you will have enough time to complete this process on Day 6.

*Instructor's note: Because of differences in equipment, the instructor should provide step-by-step instructions for the safe operation of the particular rotational molder.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

MANUFACTURING TECHNOLOGY

PLASTICS

DAY 6

ACTIVITY OVERVIEW

Today you will begin to work with the rotational molder.

REVIEW

Carefully review the operating procedures and safety instructions from Day 5.

ACTIVITY

Obtain your materials for the rotational molder from your instructor. The process of rotational molding takes almost the entire class period; therefore, you must avoid wasting time. After you start the rotational molder, you will have about 15 to 20 minutes before you can remove the mold. You should use this time to complete today's reading assignment.

READING ASSIGNMENT

Locate the book entitled Industrial Plastics in your module, and read pages 277-281.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

MANUFACTURING TECHNOLOGY

PLASTICS

DAY 7

ACTIVITY OVERVIEW

Today you will continue to work with the rotational molder.

REVIEW

Carefully review the operating procedures and safety instructions from Day 5.

ACTIVITY

Obtain your materials for the rotational molder from your instructor. The process of rotational molding takes almost the entire class period; therefore, you must avoid wasting time. After you start the rotational molder, you will have about 15 to 20 minutes before you can remove the mold. You should use the time to complete today's reading assignment.

READING ASSIGNMENT

Today you will have the opportunity to read any of the materials in your module.

*Instructor's note: The instructor should place several books about plastics and manufacturing in the module.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

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MANUFACTURING TECHNOLOGY

PLASTICS

DAY 8

ACTIVITY OVERVIEW

Today you will learn about the operation and uses of thermoforming.

WORKSHEET

Take out your worksheets for this module. Read today's study questions, and look for the answers as you complete today's assignment. Your instructor will check your answers at the end of the class and give you credit accordingly.

READING ASSIGNMENT

Locate the book entitled Industrial Plastics in your module, and read pages 157-175.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

MANUFACTURING TECHNOLOGY

PLASTICS

DAY 9

ACTIVITY OVERVIEW

Today you will operate the thermoforming molder.

ACTIVITY

*Instructor's note: Because of differences in equipment, the instructor should provide step-by-step instructions for the safe operation of the particular thermoforming molder.

CROSSWORD

Look over the clues for the crossword puzzle. Review your worksheets for this module. As you find answers to the clues, fill in the puzzle.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

MANUFACTURING TECHNOLOGY

PLASTICS

DAY 10

ACTIVITY OVERVIEW

Today is the final day in this module. You will be given a test to determine how much you have learned.

POSTTEST

Take about 10 to 15 minutes to look over your crossword puzzle and worksheets. At your instructor's signal, report to the classroom to take the posttest. Remember, the posttest counts as part of your final grade.

MODULE CHECKOUT

Today is the final day in this module; make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until the instructor checks your area.

SECTION 5

SAMPLE MODULES
(NO GRANT EQUIPMENT)

COMMUNICATION TECHNOLOGY

ENGINEERING GRAPHICS

INTRODUCTION

Industrial communication is the first step in transforming ideas into products. Accurate communication is an absolute necessity. Complex products such as automobiles, stereos, and computers, as well as structures like buildings and bridges can not be made without sophisticated communication systems. In other words, industrial communication is the very foundation of both the manufacturing and construction industries. During the next ten days, you will be exploring engineering graphics. You will work with drafting equipment to discover why drafting is the language of industry.

OBJECTIVES

1. Identify the various uses of drafting.
2. Explain why sketching is useful.
3. Describe how sketching is used in drafting.
4. Draw horizontal, vertical, and inclined lines using drafting equipment.
5. Use drafting equipment to draw geometric constructions.
6. Identify various symbols and lines used in drafting.
7. Draw and label a title block.
8. Label a drawing using proper lettering techniques.

BASIC SKILLS / ACADEMIC INTEGRATION

1. Geometry skills are reinforced through the drawing of geometric shapes.
2. Communication skills are reinforced through labeling of various drawings.
3. Measurement skills are reinforced by measuring the various distances of lines drawn.

EQUIPMENT / SUPPLIES / MATERIALS

1. drawing board and T-square
2. triangles
3. compass and dividers
4. architect's scale
5. drafting pencil, eraser, and erasing shield
6. worksheets, grid paper, and masking tape

COMMUNICATION TECHNOLOGY

ENGINEERING GRAPHICS

DAY 1

ACTIVITY OVERVIEW

Today you will learn about the various uses of drafting and how sketching is used in drafting.

READING ASSIGNMENT

Locate the book entitled (title of book) in your module, and read pages (list page numbers).

*Instructor's note: Because most instructors have access to a variety of texts, the instructor should select a book that explains the various uses of drafting and sketching.

RESEARCH QUESTIONS

Answer the following questions on your research questions worksheet. (list of questions from reading assignment)

*Instructor's note: The instructor should select several research questions from the chosen reading assignment.

ACTIVITY

Choose a simple object found in the room and make a sketch of it. Examples: stool, desk, or workbench.
Design and sketch one of the following:

1. A mailbox that signals when the mail is in.
2. A race car to be used in the International Race of Champions (IROC).
3. A reading lamp that attaches to a book.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

COMMUNICATION TECHNOLOGY

ENGINEERING GRAPHICS

DAY 2

ACTIVITY OVERVIEW

Today you will learn about the various pieces of drafting equipment you will utilize in this module.

READING ASSIGNMENT

Locate the book entitled (title of book) in your module, and read pages (list page numbers).

*Instructor's note: Because most instructors have access to a variety of texts, the instructor should select a book that explains the drafting equipment the students will utilize.

RESEARCH QUESTIONS

Answer the following questions on your research questions worksheet (list of questions from reading assignment).

*Instructor's note: The instructor should select several research questions from the chosen reading assignment.

ACTIVITY

Locate the following supplies:

1. drawing board and T-square
2. triangles
3. compass and dividers
4. architect's scale
5. drafting pencil, eraser, and erasing shield
6. several sheets of 8.5" x 11" paper and masking tape

Follow procedures listed in reading assignment to complete the following:
Tape a piece of paper near the center of the drafting board.
Draw horizontal and vertical lines.
Draw different angles with the triangles.
Draw circles using the circle template.

*Instructor's note: Because most instructors have access to a variety of texts, the instructor should select a book that explains how to use drafting equipment.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

COMMUNICATION TECHNOLOGY

ENGINEERING GRAPHICS

DAY 3

ACTIVITY OVERVIEW

Today you will begin drawing objects with the drafting equipment.

ACTIVITY

Locate the following supplies:

1. drawing board and T-square
2. triangles
3. compass and dividers
4. architect's scale
5. drafting pencil, eraser, and erasing shield
6. several sheets of 8.5" x 11" paper and masking tape

Review the reading assignment from Day 2. Complete the activities demonstrated in the reading assignment. All drawings are to full scale unless otherwise noted. Be sure to label your drawings.

*Instructor's note: Because most instructors have access to a variety of texts, the instructor should select a book that utilizes drafting equipment to draw a variety of objects, especially geometric constructions.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

COMMUNICATION TECHNOLOGY

ENGINEERING GRAPHICS

DAY 4

ACTIVITY OVERVIEW

Today you will learn the symbols and lines used by the drafting industry.

READING ASSIGNMENT

Locate the book entitled (title of book) in your module, and read pages (list page numbers).

*Instructor's note: Because most instructors have access to a variety of texts, the instructor should select a book that explains drafting symbols and lines.

WORKSHEET

Obtain a worksheet on symbols and lines.

*Instructor's note: Because most instructors have access to a variety of texts, the instructor can select worksheets from the reading assignment or make one for the activity.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

COMMUNICATION TECHNOLOGY

ENGINEERING GRAPHICS

DAY 5

ACTIVITY OVERVIEW

Today you will learn how to draw and label a title block and draw the principal views of an object using orthographic projection.

READING ASSIGNMENT

Locate the book entitled (title of book) in your module, and read pages (list page numbers).

*Instructor's note: Because most instructors have access to a variety of texts, the instructor should select a book that explains how to draw and label a title block.

WORKSHEET

Obtain the worksheet on how to draw and label a title block.

*Instructor's note: Because most instructors have access to a variety of texts, the instructor can select worksheets from the reading assignment or make one for the activity.

ACTIVITY

Locate the book entitled (title of book) in your module, and read pages (list page numbers).
Complete the orthographic projection on the title block you have just completed.

*Instructor's note: Because most instructors have access to a variety of texts, the instructor should select a book that explains how to draw the 3 views of an object using orthographic projection.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

COMMUNICATION TECHNOLOGY

ENGINEERING GRAPHICS

DAY 6

ACTIVITY OVERVIEW

Today you will continue working with orthographic projections.

ACTIVITY

An orthographic projection is nothing more than a drawing of an object looking at it from various sides, top, and bottom. Review the reading assignment from Day 5 if you are still unsure how these views are drawn.

*Instructor's note: Because most instructors have access to a variety of texts, the instructor should select a book that explains how to draw the 3 views of an object using orthographic projection.

WORKSHEET

Obtain a multi-view projection worksheet. Tape the worksheet to your drawing board, making sure that the border line aligns with your T-square. Determine which lines are missing in the views provided, and complete them.

*Instructor's note: Because most instructors have access to a variety of texts, the instructor can select worksheets from the reading assignment or make one for the activity.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

COMMUNICATION TECHNOLOGY

ENGINEERING GRAPHICS

DAY 7

ACTIVITY OVERVIEW

Today you will continue working with orthographic projections.

WORKSHEET

Obtain a missing views worksheet. Tape the worksheet to your drawing board, making sure that the border line aligns with your T-square. Determine which views are missing in each of the problems, and complete them.

*Instructor's note: Because most instructors have access to a variety of texts, the instructor can select worksheets from the reading assignment or make one for the activity.

ACTIVITY

Draw an orthographic projection of the object you sketched on Day 1. Make sure that your views line up above, below, and beside each other.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

COMMUNICATION TECHNOLOGY

ENGINEERING GRAPHICS

DAY 8

ACTIVITY OVERVIEW

Today you will learn how to draw letters and numerals used in the drafting industry.

READING ASSIGNMENT

Locate the book entitled (title of book) in your module, and read pages (list page numbers).

*Instructor's note: Because most instructors have access to a variety of texts, the instructor should select a book that explains how to draw letters and numerals used in the drafting industry.

WORKSHEET

Obtain the lettering and numerals worksheet.

*Instructor's note: Because most instructors have access to a variety of texts, the instructor can select worksheets from the reading assignment or make one for the activity.

ACTIVITY

Complete the lettering and numerals worksheet. The objective of this exercise is to draw the letters and numerals exactly as you see them. DO NOT PRINT! Be sure to keep your pencil sharp so that your letters and numerals remain neat.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

COMMUNICATION TECHNOLOGY

ENGINEERING GRAPHICS

DAY 9

ACTIVITY OVERVIEW

Today you will add dimensioning to your drafting skills.

READING ASSIGNMENT

Locate the book entitled (title of book) in your module, and read pages (list page numbers).

*Instructor's note: Because most instructors have access to a variety of texts, the instructor should select a book that explains dimensioning.

WORKSHEET

Obtain the dimensioning worksheet.

*Instructor's note: Because most instructors have access to a variety of texts, the instructor can select worksheets from the reading assignment or make one for the activity.

ACTIVITY

Complete the dimensioning worksheet. Be sure to fill in the correct letters and numerals for each drawing.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

COMMUNICATION TECHNOLOGY

ENGINEERING GRAPHICS

DAY 10

ACTIVITY OVERVIEW

Today is the final day in this module. You will be given a test to determine how much you have learned.

POSTTEST

Take about 10 to 15 minutes to look over your reading assignments and research questions. At your instructor's signal, report to the classroom to take the posttest. Remember, the posttest counts as part of your final grade.

MODULE CHECKOUT

Today is the final day in this module. Make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks out your area.

CONSTRUCTION TECHNOLOGY

ENGINEERING

INTRODUCTION

During the next two weeks you will learn about the history of bridges, terms used in engineering, and the different types of stresses that bridges must overcome. Additionally, your team will design and construct a bridge that will be tested for strength at the end of this unit.

OBJECTIVES

By the end of this module, the student should be able to:

1. Describe the four types of stress that act upon bridges.
2. Identify the major types of truss beam bridges.
3. Discuss the important factors in bridge design.
4. Define terms used in civil engineering.
5. Design a truss bridge.
6. Build a bridge according to given specifications.

BASIC SKILLS / ACADEMIC INTEGRATION

1. Math skills are reinforced through the use and testing of different geometric shapes.
2. Measurement skills are reinforced throughout construction of bridge.
3. Industrial technology and math classes are encouraged to work together on the designing, construction, and testing of bridges.
4. Math skills are used to determine the efficiency of bridge design.

EQUIPMENT / SUPPLIES / MATERIALS

Equipment
X-acto knife or stick cutter
Bridge testing unit

Supplies
Cardboard
Straight pins
Wax paper
Glue
Wooden sticks

Materials
Video - "Building Your Bridge," Hearlihy: Springfield, Ohio.
Books - The Pitsco Bridge Building Book, Pitsco: Pittsburgh, Kansas.
Bridges, Theta Industrial Products: Mound, Minnesota.

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CONSTRUCTION TECHNOLOGY

ENGINEERING

DAY 1

ACTIVITY OVERVIEW

Today you will learn about the history of bridges. Additionally, you will learn about the important factors in bridge design.

CROSSWORD

Look over the clues for the crossword puzzle. As you have free time during completion of this module, fill in the puzzle. This crossword puzzle MUST be completed by the end of this module.

WORKSHEET

Take out your worksheets for this module. Read today's study questions and look for the answers as you complete today's assignment. Your instructor will check your answers at the end of the class and give you credit accordingly.

READING ASSIGNMENT

Locate the book entitled The Pitsco Bridge Building Book in your module, and read pages 1-8.
Locate the book entitled Bridges in your module, and read pages 3-12.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

CONSTRUCTION TECHNOLOGY

ENGINEERING

DAY 2

ACTIVITY OVERVIEW

Today you will start to design your bridge.

VIDEO

Locate the video "Building Your Bridge," and take it to the video viewing area. After watching the video, rewind the tape, and return it to your module.

READING ASSIGNMENT

Locate the book entitled The Pitsco Bridge Building Book in your module, and read page 10. DO NOT MAKE YOUR SKETCHES IN THIS BOOK.

WORKSHEET

Take out your worksheets for this module, and find the "Design Sketches" worksheet. Each student should make at least four thumbnail sketches for possible bridges. These are only sketches, so take this opportunity to experiment with several different ideas. Your instructor will check your drawings at the end of the class.

ACTIVITY

You and your partner should look at all your sketches and decide on a final design for your bridge. Sketch the top, front, and end views on the back of one of your "Design Sketch" worksheets.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

CONSTRUCTION TECHNOLOGY

ENGINEERING

DAY 3

ACTIVITY OVERVIEW

Today you will make the finish drawing for your bridge. This drawing will be used as a template for the construction of your bridge. The superstructure of your bridge must be 12" long and 3" wide. The substructure of your bridge must be 10" long and 3" wide. You will be given 20 feet of balsa (10 sticks, 2' ea.) to construct the bridge. You must make sure that your design can be completed with the given materials. The specifications and limitations are similar to the ones that an engineer would be faced with on a daily basis.

READING ASSIGNMENT

Locate the book entitled The Pitsco Bridge Building Book in your module, and read pages 11 and 12.

ACTIVITY

Obtain a sheet of grid paper from your instructor. Make a working drawing of your bridge design using a format similar to the one on page 12 of your reading. DO NOT COPY THIS DRAWING. YOUR BRIDGE SHOULD BE YOUR DESIGN.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

CONSTRUCTION TECHNOLOGY

ENGINEERING

DAY 4

ACTIVITY OVERVIEW

Today you will learn about the purposes of models and preview the model construction methods to be used on your bridge. If time permits, obtain your materials from your instructor and begin building your bridge.

READING ASSIGNMENT

Locate the book entitled The Pitsco Bridge Building Book in your module, and read pages 14-18.

SAFETY

The blade on the stick cutter is very sharp, so extra care must be taken to keep fingers clear of the cutting area.

ACTIVITY

If time permits, obtain materials from your instructor and begin construction of your bridge.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

CONSTRUCTION TECHNOLOGY

ENGINEERING

DAY 5

ACTIVITY OVERVIEW

Today you will begin construction of your bridge.

SAFETY

The blade on the stick cutter is very sharp, so extra care must be taken to keep fingers clear of the cutting area.

ACTIVITY

Obtain materials from your instructor, and begin construction of your bridge. You will have five days to complete your bridge. This may seem like a lot of time; however, if you waste any time, you will not be able to complete your bridge. Time management is an important consideration in both engineering and construction.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

CONSTRUCTION TECHNOLOGY

ENGINEERING

DAY 6

ACTIVITY OVERVIEW

Today you will continue to work on your bridge.

SAFETY

The blade on the stick cutter is very sharp, so extra care must be taken to keep fingers clear of the cutting area.

ACTIVITY

Obtain materials from your instructor, and begin construction of your bridge. You will have only 4 days left to complete your bridge. Remember, if you waste any time, you will not be able to complete your bridge. Time management is an important consideration in both engineering and construction.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

CONSTRUCTION TECHNOLOGY

ENGINEERING

DAY 7

ACTIVITY OVERVIEW

Today you will continue to work on your bridge.

SAFETY

The blade on the stick cutter is very sharp, so extra care must be taken to keep fingers clear of the cutting area.

ACTIVITY

Obtain materials from your instructor, and begin construction of your bridge. You will have only 3 days left to complete your bridge. Remember, if you waste any time, you will not be able to complete your bridge. Time management is an important consideration in both engineering and construction.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

CONSTRUCTION TECHNOLOGY

ENGINEERING

DAY 8

ACTIVITY OVERVIEW

Today you will continue to work on your bridge.

SAFETY

The blade on the stick cutter is very sharp, so extra care must be taken to keep fingers clear of the cutting area.

ACTIVITY

Obtain materials from your instructor, and begin construction of your bridge. You will have only 2 days left to complete your bridge. Remember, if you waste any time, you will not be able to complete your bridge. Time management is an important consideration in both engineering and construction.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

CONSTRUCTION TECHNOLOGY

ENGINEERING

DAY 9

ACTIVITY OVERVIEW

Today you will complete the construction of your bridge.

SAFETY

The blade on the stick cutter is very sharp, so extra care must be taken to keep fingers clear of the cutting area.

ACTIVITY

Obtain materials from your instructor, and begin construction of your bridge. Today is the last day you will have to complete your bridge. Remember, if you waste any time, you will not be able to complete your bridge. Time management is an important consideration in both engineering and construction.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

CONSTRUCTION TECHNOLOGY

ENGINEERING

DAY 10

ACTIVITY OVERVIEW

Today is the final day in this module. You will be given a test to determine how much you have learned.

POSTTEST

Take about 10 to 15 minutes to look over your crossword puzzle and worksheets. At your instructor's signal, report to the classroom to take the posttest. Remember, the posttest counts as part of your final grade.

MODULE CHECKOUT

Today is the final day in this module; make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until the instructor checks your area.

ENERGY, POWER AND TRANSPORTATION TECHNOLOGY

AVIATION

INTRODUCTION

The study of aviation has always fascinated people. During your study of aviation you should observe how it interrelates with other areas of technology. Communication technology skills are needed to design a safe, economical aircraft, as well as communicate with it. Manufacturing technology skills are utilized to develop new materials and fabricate these materials into the completed craft. Without construction technology skills, airplanes would have no place to land, and there would be no buildings to handle passengers or luggage. During the next ten days, you will explore the basic components of an airplane, the theory of flight, and flight control systems. You will also see how the airplane has impacted society.

OBJECTIVES

By the end of this module, the student will be able to:

1. Explain how an airplane flies using the terms lift, gravity, thrust, and drag.
2. Give examples of the types of aircraft, and discuss their differences.
3. Explain basic power sources of aircraft.
4. Identify and discuss the functions of the parts of an aircraft.
5. Give examples of an airplane's control surfaces and their functions.
6. Identify aviation oriented careers.

BASIC SKILLS / ACADEMIC INTEGRATION

1. Science skills are reinforced through the study of lift.
2. Science skills are reinforced through the study of aerodynamics.
3. Social studies skills are reinforced through the study of aviation history.
4. Math skills are reinforced through flight planning calculations.

EQUIPMENT / SUPPLIES / MATERIALS

1. Computer.
2. Flight simulation software.
3. Video - aviation history.
4. Video - principles of aviation.
5. Book - overview of aviation.

ENERGY, POWER AND TRANSPORTATION TECHNOLOGY

AVIATION

DAY 1

ACTIVITY OVERVIEW

In this module, through reading assignments, videotape presentations, and computer simulation you will learn about aviation. You will cover a brief history of aviation. You will learn about aircraft propulsion and control systems, types of aircraft and their uses, and the principles of flight. Through the use of computer simulation you will have an opportunity to experience what is involved in piloting an airplane.

VOCABULARY WORDS

Write the following vocabulary words and their definitions on your module record sheet under "vocab." This will serve as an excellent study guide for your posttest on this module.

1. Ailerons
2. Fuselage
3. Composites
4. Stealth
5. Pitch

RESEARCH QUESTIONS

Read each question carefully and write the question and correct answer on your module record sheet under "Research." These research questions will be used as a study guide for your posttest.

1. The Wright brothers' first flight went a total of (1) 120 ft. (2) 320 ft. (3) 1000 ft. (4) 1 mi.

2. Charles Lindbergh's Atlantic crossing went from New York to (1) London. (2) Madrid. (3) Paris. (4) Belfast.

3. The first man to fly faster than the speed of sound was (1) Lindbergh. (2) Yeager. (3) Wright. (4) deHaviland.

4. The energy of air on the top of the wing that keeps an airplane up is (1) gravity. (2) thrust. (3) drag. (4) lift.

5. The pulling power of the propeller pulling the airplane forward is (1) drag. (2) thrust. (3) gravity. (4) lift.

VIDEO

Find the video in your module entitled " * (see below) ________," and watch it. This program will show you the different types of air transportation. You will see that forces act on a plane during flight and what effect the control surfaces have on the plane. When you have finished, rewind the tape, and return it to the storage rack.

*Insert your selection of a video presentation to match description.

READING ASSIGNMENT

Find the book in your module entitled " * (see below) ________," and read it. You will learn about early flying machines and what makes them fly.

*Insert your selection of reading material to match description.

MODULE CHECKOUT

Make sure that your module is clean and that everything is put in its proper place.

ENERGY, POWER AND TRANSPORTATION TECHNOLOGY

AVIATION

DAY 2

ACTIVITY OVERVIEW

In today's session you will see many recent innovations in aviation. You will also read more about the principles of flight and ways of controlling an airplane in flight, as well as the parts of an airplane.

VIDEO

Find the video in your module entitled " * (see below) ________," and watch it. This presentation will show you how planes are being made safer and more reliable. You will also see new advances in design and material use. When you have finished, rewind the tape, and return it to the storage rack.

*Insert your selection of a video presentation to match description.

READING ASSIGNMENT

Find the book in your module entitled " * (see below) ________," and read pages " * (see below) ________." This is more information about aircraft parts, control surfaces, propulsion, and the principles of flight.

*Insert your selection of reading material to match description.

MODULE CHECKOUT

Make sure that your module is clean and that everything is put in its proper place.

ENERGY, POWER AND TRANSPORTATION TECHNOLOGY

AVIATION

DAY 3

ACTIVITY OVERVIEW

In today's session you will complete your last reading assignment, and in it you will cover many different aviation related topics.

READING ASSIGNMENT

Find the book in your module entitled " * (see below) ________," and read it. This material will give you insight into many recent developments in the field of aviation. You will learn about new aircraft designs, new propulsion methods, and new materials and developments in safety.

*Insert your selection of reading material to match the description.

VOCABULARY WORDS

Write the following vocabulary words and their definitions on your module record sheet under "vocab." This will serve as an excellent study guide for your posttest in this module.

6. Lift
7. Helicopters
8. Drag
9. Dihedral
10. Elevator

RESEARCH QUESTIONS

Read each question carefully, and write the question and correct answer on the module record sheet under "Research." These research questions will be used as a study guide for your posttest.

6. Movement of a plane from left to right is called (1) yaw. (2) pitch. (3) roll. (4) dive.

7. Movement of the plane's nose up or down is called (1) yaw. (2) pitch. (3) roll. (4) dive.

8. Banking (leaning) to the left or right is called (1) yaw. (2) pitch. (3) roll. (4) dive.

9. The control surface on the wing that controls the plane's banking is called the (1) rudder. (2) elevator. (3) stabilizer. (4) aileron.

10. The control surface that moves the nose of the plane from left to right is called the (1) rudder. (2) elevator. (3) stabilizer. (3) aileron.

MODULE CHECKOUT

Make sure that your module is clean and that everything is put in its proper place.

ENERGY, POWER AND TRANSPORTATION TECHNOLOGY

AVIATION

DAY 4

INSTRUCTOR CHECK

Open your notebook and have all of your record sheets and worksheets out on top of your module. The instructor will check your work. Do not go on with your activities until the instructor has checked your work.

ACTIVITY OVERVIEW

In today's session you will begin to fly, so to speak. You will use the flight simulator software and the computer to experience flight.

READING ASSIGNMENT

Find the book in your module entitled " * (see below) ________," and read pages " * (see below) ________." This section will cover the instruments and controls found in the average light airplane. You will need to know what most of these instruments and controls do or indicate in order to keep flying.

*Select a flight simulation program that you are comfortable with, and use its documentation.

COMPUTER PROGRAM

Turn the computer on, and load " * (see below) ________," from the hard drive. Take the rest of the period to become familiar with the program. This is a complex program, and you will find that there are many pull down menus as well as commands that can be entered through the keyboard. In the module you will find several sheets to help you with the menus and the keyboard commands.

*Your chosen flight simulation program.

MODULE CHECKOUT

Make sure that your module is clean and that everything is put in its proper place.

ENERGY, POWER AND TRANSPORTATION TECHNOLOGY

AVIATION

DAY 5

ACTIVITY OVERVIEW

In today's session you will continue using the flight simulator. You will learn how to taxi the plane, take off, and become airborne.

READING ASSIGNMENT

Find the book in your module entitled " * (see below) ________," and read pages " * (see below) ________." This material will show you how to taxi and call up weather information and air traffic control. You will also perform your first takeoff.

*Select reading assignment from the documentation supplied with flight simulation program you decide to use.

ASSIGNMENT

Boot up flight simulator program on the computer, and practice what you learned in the manual. Good luck keeping your plane aloft once you take off.

MODULE CHECKOUT

Make sure that your module is clean and that everything is put in its proper place.

ENERGY, POWER AND TRANSPORTATION TECHNOLOGY

AVIATION

DAY 6

ACTIVITY OVERVIEW

In this session you will learn how to climb after takeoff, level off, and fly straight.

READING ASSIGNMENT

Find the book in your module entitled " * (see below) ________," and read pages " * (see below) ________." This material will show you how to climb after takeoff, level off, and fly straight.

*Select reading assignment from the documentation supplied with the flight simulation program you decide to use.

ASSIGNMENT

Boot up flight simulator program on the computer. Follow what you just learned in the reading assignment, and practice taking off, climbing to altitude and leveling off for straight flight. Remember to keep an eye on all of your instruments. There are several loose sheets in your module to help you with many of the commands you need.

MODULE CHECKOUT

Make sure that your module is clean and that everything is put in its proper place.

ENERGY, POWER AND TRANSPORTATION TECHNOLOGY

AVIATION

DAY 7

ACTIVITY OVERVIEW

In this session you will learn to make turns, one of the basic flight maneuvers every pilot must master.

READING ASSIGNMENT

Find the book in your module entitled " * (see below) _______," and read pages " * (see below) _______." This material will show you the three types of turns that are normally made. You will learn how to properly start the turn, end the turn, and return to straight and level flight.

*Select reading assignment from the documentation supplied with the flight simulation program you decide to use.

ASSIGNMENT

Turn on the computer, and boot up the flight simulator program. You will see that each lesson builds on the previous lesson in a natural progression. You have learned to taxi, take off, climb, and fly level. Today you will practice making turns so that you will be able to fly where you want to go and not just where the plane is aimed.

MODULE CHECKOUT

Make sure that your module is clean and that everything is put in its proper place.

ENERGY, POWER AND TRANSPORTATION TECHNOLOGY

AVIATION

DAY 8

ACTIVITY OVERVIEW

In this session you will learn to go from level flight into a descent and, ultimately, to land the plane.

READING ASSIGNMENT

Find the book in your module entitled " * (see below) ________," and read pages " * (see below) ________." This material will show you how to plan for a landing. You will learn how to start your descent, make the final landing approach, prepare to land, and actually land.

*Select reading assignment from the documentation supplied with the flight simulation program you decide to use.

ASSIGNMENT

Turn on the computer, and boot up the flight simulator program. You will need to practice descending and landing many times as the procedures are involved and tricky. This program has a built-in feature that allows you to practice landings over and over again to help perfect your technique. To get into this practice mode, follow the instructions on page " * (see below) ________." You sure are fortunate--you don't have to pay for the planes you crash!

*Select reading assignment from the documentation supplied with the flight simulation program you decide to use.

MODULE CHECKOUT

Make sure that your module is clean and that everything is put in its proper place.

ENERGY, POWER AND TRANSPORTATION TECHNOLOGY

AVIATION

DAY 9

ACTIVITY OVERVIEW

In this session you will learn how to fly a rectangular traffic pattern.

READING ASSIGNMENT

Find the book in your module entitled " * (see below) _______," and read pages " * (see below) _______." This material will teach you to fly a rectangular traffic pattern and practice your flying.

*Select reading assignment from program documentation.

ASSIGNMENT

Turn on the computer and boot up the flight simulator program. Follow the procedures outlined in the manual that will give you practice using everything you have learned so far. The purpose of flying a traffic pattern is to practice takeoffs, 90-degree turns, descents, and landings. Successfully completing this step shows that you have the flight savvy and coordination skills that are necessary to become a good pilot and demonstrates that you can fly a flight from beginning to end.

MODULE REVIEW

This is the last day in this module. You will be given a posttest for this module in the next session. If you have time left in this session, review all that you have learned and be prepared for the next session.

MODULE CHECKOUT

Make sure that your module is especially clean today. You will not be allowed to leave until your module is in exact order. Wipe off all surfaces, and make sure that everything is returned to its proper place. When you have finished your cleanup, sit quietly until the instructor checks your module. Good luck on the posttest!

ENERGY, POWER AND TRANSPORTATION TECHNOLOGY

AVIATION

DAY 10

ACTIVITY OVERVIEW

Today is the final day in this module. You will be given a test to determine how much you have learned.

POSTTEST

T..'e about 10 to 15 minutes to look over your crossword puzzle and worksheets. At your instructor's signal, report to the classroom to take the posttest. Remember, the posttest counts as part of your final grade.

MODULE CHECKOUT

Today is the final day in this module; make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until the instructor checks your area.

MANUFACTURING TECHNOLOGY

PACKAGE DESIGN

INTRODUCTION

Packaging design provides a link between manufacturing and the other areas of technology. Communication technology skills are needed to design a package that persuades and informs the prospective consumer, while methods of testing used in construction technology can be adapted to evaluate the effectiveness of a package to adequately protect the product. Additionally, a working knowledge of transportation technology is useful when designing a package that is easy to distribute. During the next ten days, you will be exploring the area of package design. You will design and construct several prototypes of packages and construct a final package that satisfies all the requirements addressed in this module.

OBJECTIVES

By the end of this module, the student should be able to:

1. List the three basic functions of a good package.
2. Describe how different geometric shapes add to the strength of a package.
3. Test package designs for strength.
4. Design and construct a package for a specific item.
5. Provide written instructions to be included in a package.

BASIC SKILLS / ACADEMIC INTEGRATION

1. Geometry skills are reinforced through the use and testing of different geometric shapes.
2. Language arts skills are reinforced during the development of written instructions to be included in package.
3. Instructor may wish to allow student to work with art department in the development of graphics for package.

EQUIPMENT / SUPPLIES / MATERIALS

<u>Equipment</u>
Scissors
Ruler
Computer with word processing and paint programs (optional)

<u>Supplies</u>
Glue
8.5" x 11" card stock
Poster board

<u>Materials</u>
Teacher-made video "Testing Your Package Design"
Book that covers the functions of a good package

MANUFACTURING TECHNOLOGY

PACKAGE DESIGN

DAY 1

ACTIVITY OVERVIEW

Today you will learn about the functions of a good package. These functions include protecting the product, promoting the product, and making the product easy to distribute.

READING ASSIGNMENT

Locate the book entitled (title of book) in your module, and read pages (list page numbers).

*Instructor's note: Because most instructors have access to a wide variety of texts, the instructor should select a book that covers the functions of a good package.

VOCABULARY

List and define the following terms on your vocabulary worksheet.
(list of terms from reading assignment)

*Instructor's note: The instructor should select several vocabulary words from the chosen reading assignment.

ACTIVITY

Locate the sample packages found in your module. Analyze each package to determine how well it protects the product, promotes the product, and makes the product easy to distribute. For each sample, your team should suggest ways in which the package can be improved. Record the results of your analysis under the section of your worksheet labeled "Package Analysis."

*Instructor's note: The instructor should place eight samples of packages in the module area. These samples should be numbered 1 through 8.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

MANUFACTURING TECHNOLOGY

PACKAGE DESIGN

DAY 2

ACTIVITY OVERVIEW

Today you will construct several packages using different geometric shapes. These packages will be tested on Day 3 of this module.

ACTIVITY

Locate the following supplies:
3 sheets of 8.5" x 11" card stock
Glue
Scissors
Ruler

Using one sheet of card stock per package, construct three different packages. Use this opportunity to experiment with different geometric shapes.

Each package must meet the following specifications:
It must be 3" tall.
It must have a permanently attached top and bottom.
Only glue may be used to hold the package together.
It must be at least 3" wide at the narrowest point.
The top and bottom of the package must be parallel.

*Instructor's note: Provide some samples of packaging utilizing several different geometric shapes. Additionally, provide storage for today's packages until testing on Day 3.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

MANUFACTURING TECHNOLOGY

PACKAGE DESIGN

DAY 3

ACTIVITY OVERVIEW

Today you will test the packages constructed on Day 2.

VIDEO

Locate the video "Testing Your Package Designs," and take it to the video viewing area. After watching the video, rewind the tape, and return it to your module.

*Instructor's note: The instructor should determine how the packages will be tested. One way the package can be tested is by stacking identical books on the package until it collapses. Once the instructor determines the method to be used, s/he should make a video demonstrating the testing method and name it "Testing Your Package Designs."

ACTIVITY

Following the procedure outlined in the video, test each of your packages constructed on Day 2. The results of each test should be recorded on the "Packaging Test Data Sheet."

*Instructor's note: Based on the testing method chosen, the instructor should develop a test data sheet to record the results of each test. Research questions requiring the team of students to analyze the results of the tests should be included on the test data sheet.

RESEARCH QUESTIONS

Using the results of the above tests, complete the "Research Questions" found on the "Packaging Test Data Sheet."

INSTRUCTOR

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

PACKAGE DESIGN

DAY 4

ACTIVITY OVERVIEW

Today you will begin to design and construct a package for one of several items.

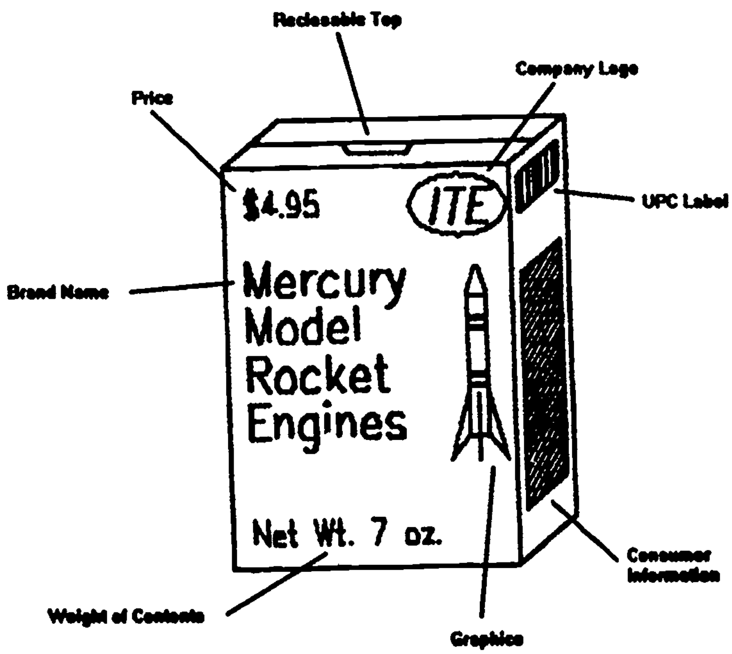
ASSIGNMENT

For the next few days, you will be designing and constructing a package for one of the following items:

6 CO_2 cartridges
12-pack of ink pens
Computer printer ribbon
Pocket calculator

The package must contain the following elements:

Price
Reclosable top
Company logo
UPS label
Consumer information
Graphics
Weight of contents
Brand name



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ACTIVITY

1. Locate the "Day 4 Sample Package" worksheet.
2. Follow the written directions to assemble the sample package.
3. Select one of the following items to package:
   6 CO_2 cartridges
   12-pack of ink pens
   Computer printer ribbon
   Pocket calculator
4. Determine the size requirements for the item(s) to be packaged.
5. Make a pattern for the package. (similar to worksheet)
6. Obtain an 8.5" x 11" sheet of card stock from your instructor.
7. Construct a first run (no text or graphics) prototype package using your pattern. Important--do not destroy the pattern!

*Instructor's note: Based on the availability of equipment and materials, the instructor should specify whether or not the design process should be done on a computer.

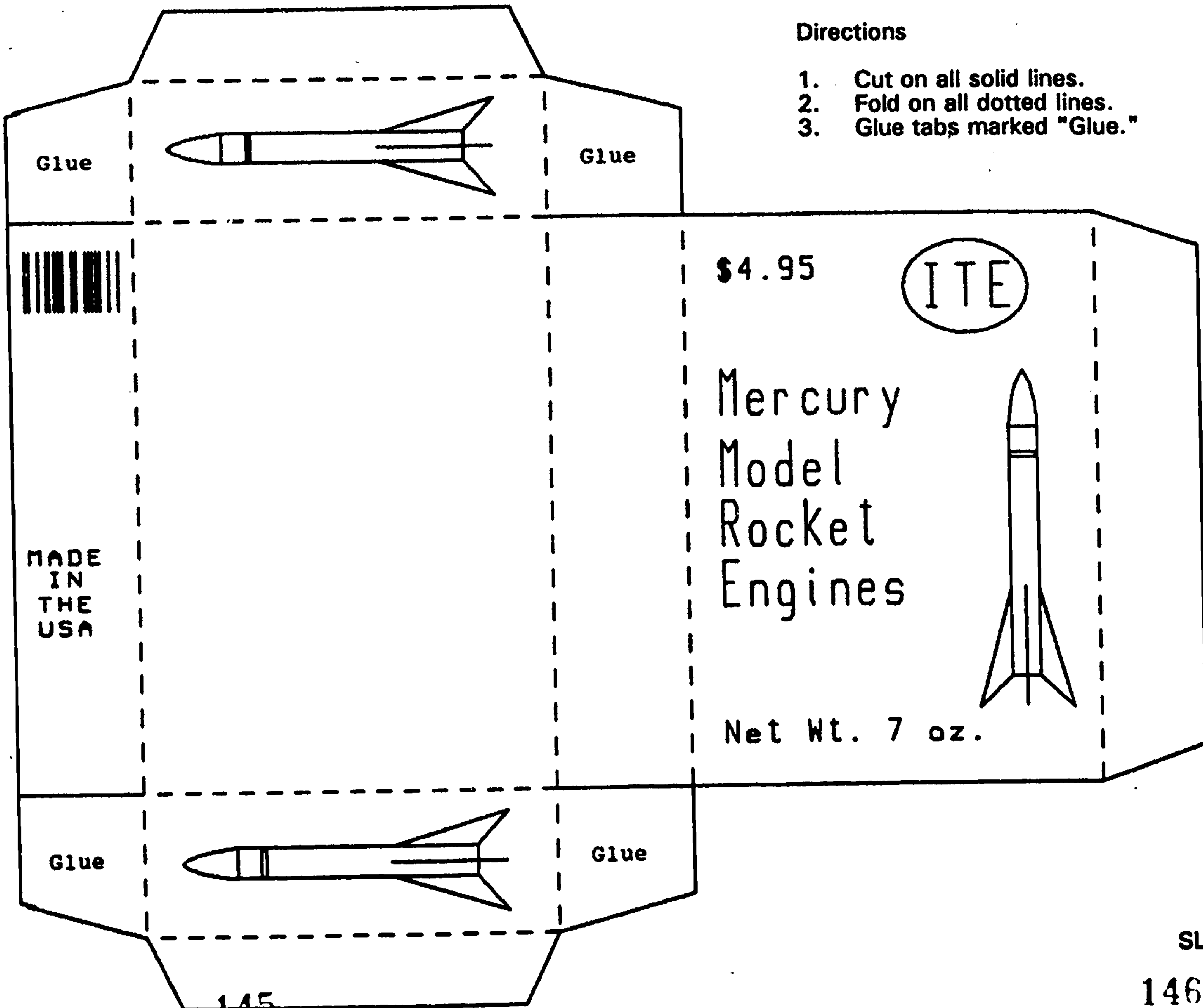
INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

DAY 4 SAMPLE PACKAGE

Directions

1. Cut on all solid lines.
2. Fold on all dotted lines.
3. Glue tabs marked "Glue."



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MANUFACTURING TECHNOLOGY

PACKAGE DESIGN

DAY 5

ACTIVITY OVERVIEW

Today you will continue to design a package for the item your team selected on Day 4.

ACTIVITY

Company Logo

1. Your team should decide on a name for the company that will produce your chosen product.
2. Each member of the team should make thumbnail sketches of 3 possible company logos.
3. After examining all the sketches of logos, the team should select one to be used on the package.

Brand Name

1. Your team should decide on a brand name for the product.
2. Each member of the team should make thumbnail sketches of 2 possible types of styles and layouts of the brand name.
3. After examining all the sketches, the team should select one to be used on the package.

Graphics

1. Each member of the team should make thumbnail sketches of 3 possible graphics to be used on the package.
2. After examining all the sketches, the team should select one to be used on the package.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

MANUFACTURING TECHNOLOGY

PACKAGE DESIGN

DAY 6

ACTIVITY OVERVIEW

Today you will continue to design a package for the item your team selected on Day 4.

ACTIVITY

Using the company logo, brand name, and graphics designed on Day 5, add the following elements to your package pattern from Day 4:

Price
Company logo
UPS label
Consumer information
Graphics
Weight of contents
Brand name

*Instructor's note: Based on the availability of equipment and materials, the instructor should specify whether or not this activity should be done on a computer. Additionally, colored pens and markers should be provided for the design team.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

MANUFACTURING TECHNOLOGY

PACKAGE DESIGN

DAY 7

ACTIVITY OVERVIEW

Today you will complete the package design started on Day 4.

ACTIVITY

1. Using the pattern completed on Day 6, make several samples of your package (at least 3).
2. Design a poster to promote the product.
3. Arrange the poster and samples in a manner that best promotes the product.
4. Have your instructor check your assignment before going any further.

*Instructor's note: The instructor may want to make copies of the completed pattern available to the team or allow students to have access to tracing paper, a photocopy machine, or a spirit duplicator.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

MANUFACTURING TECHNOLOGY

PACKAGE DESIGN

DAY 8

ACTIVITY OVERVIEW

Today you will complete a set of instructions to be included in product's package.

ACTIVITY

An important consideration when designing a package for a product is determining the need for supplementary written material to be included in the package. This material may provide assembly instructions, directions for use of the product, troubleshooting procedures, service manuals, safety precautions, or any other information that might be useful to the consumer. In addition to text, sketches and pictures may be a part of this material.

Your team should complete a set of instructions for one of the following:

- Assembly of a CO_2 powered dragster
- Safe operation of a hot glue gun
- Loading of film in 35mm camera
- Assembly of a model rocket

*Instructor's note: Based on the availability of a computer, the instructor may wish to require these instructions to be completed using a word processing program.

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

MANUFACTURING TECHNOLOGY

PACKAGE DESIGN

DAY 9

ACTIVITY OVERVIEW

Today you will develop a package using an alternative form of packaging.

ACTIVITY

*Instructor's note: Due to different equipment configurations, the instructor should select an activity based on the availability of equipment and materials found at the local level. Packaging activities might include the following:

- Thermoforming plastics
- Shrink wrap
- Styrofoam
- Recycled materials
- Bags (paper or plastic)
- Cans
- Tray pack
- Paper with plastic window
- Cardboard

INSTRUCTOR CHECK

When you have reached the end of today's lesson, make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks today's assignment.

MANUFACTURING TECHNOLOGY

PACKAGE DESIGN

DAY 10

ACTIVITY OVERVIEW

Today is the final day in this module. You will be given a test to determine how much you have learned.

POSTTEST

Take about 10 to 15 minutes to look over your vocabulary and research questions. At your instructor's signal, report to the classroom to take the posttest. Remember, the posttest counts as part of your final grade.

MODULE CHECKOUT

Today is the final day in this module; make sure that all materials are in their proper locations and that the module area is clean. Stay in your module until your instructor checks out your area.

SECTION 6

TECHNOLOGY CORE COMPETENCIES

COMMUNICATION TECHNOLOGY CORE COMPETENCIES

The communication and media technology cluster is designed to provide students with an opportunity to become acquainted with fundamentals of graphic, audiovisual, and line communications. Also included is occupational information related to this important part of our industrial and technological society. Learning experiences include drawing and sketching, photography, screen printing, radio and television production, data transmission, computer design and application, and new and emerging communication technologies. Suggested instructional units are:

Audiovisual Systems
Basic Drafting
Computer Aided Design
Computer Utilization
Graphic Communications
Basic Photography
Telecommunications
Careers in Communication

Every school offering Industrial Technology should include a communication technology cluster. The Introduction to Industrial Technology Education Communication Cluster (Grades 7-8) and Industrial Technology Education I and II (Grades 9-10) shall include the following core competencies:

The student shall be given the opportunities, during a 9-week course, to:

1. Apply sketching techniques to develop drawing and graphic problem solving skills.

2. Describe the sizes and shapes of objects through traditional techniques.

3. Apply design principles to composition and layout techniques.

4. Produce graphic products using current accepted methods of image generation.

5. Describe various types and uses of communication systems.

6. Describe the principles of electronics as used in communication.

7. Utilize the potential of the computer to create, store, and alter graphic images.

8. Utilize current computer hardware and software to assist in collecting, storing, retrieving, and applying data.

9. Investigate new and emerging communication systems.

10. Discriminate among the effects of cultural differences upon the development and use of communication technologies during the past, present, and future.

11. Compare and identify possible occupational choices and the training required for those choices in communication.

An 18-week course in the Industrial Technology Education Communication Cluster shall include all of the previous competencies plus the following:

1. Use accepted graphic standards, symbols, and conventions in producing graphic elements.
2. Use appropriate drafting conventions to describe the shapes and sizes of objects.
3. Apply appropriate photographic, graphic, electronic, and telecommunication equipment to produce communication products.
4. Produce products using photographic techniques, materials, and equipment.
5. Design, create, and produce graphic arts products.
6. Apply current and emerging principles of telecommunication.
7. Use standard sketching techniques for graphic problem skills.
8. Understand the relationship between points, lines, and planes through orthographic/multi-view drawing principles.
9. Detail objects and/or structures through accepted size and shape descriptive principles.
10. Solve graphic problems through the application of the principles of descriptive geometry.
11. Produce drawing related to manufacturing and/or construction.
12. Apply the principles of size description as related to geometric tolerance and precision dimensioning.
13. Practice accepted standards, symbols, and conventions as related to drafting and design.
14. Use computer hardware and software in the development of suitable graphic elements to produce technical drawings appropriate to manufacturing and/or construction.
15. Use the principles of composition and design in the production of communication products.
16. Use appropriate chemistry for graphic arts and photography safely.
17. Recognize various numbering systems (binary and hex) and codes.
18. Explore radio, television, telephone, satellite systems, and fiber optics.
19. Utilize computer-aided drafting (CAD) hardware and software.

20. Apply the use of computers to telecommunications systems.

21. Use computer image generation methods to communicate information and ideas.

A 36-week course in the Industrial Technology Education Communication Cluster shall include all of the previous competencies plus the following:

1. Use accepted design principles of style, energy efficiency, safety, security, and ergonomics.
2. Produce products utilizing current electronic communication technologies.
3. Apply accepted lettering practices and styles used in manufacturing and/or construction graphics.
4. Represent objects and/or structures through various pictorial development techniques.
5. Identify layout and assembly and/or construction methods through graphic techniques.
6. Produce drawings related to alternative design and construction.
7. Apply new and emerging techniques of optics and light control.
8. Produce graphic images using the production stages of design, image generation, reproduction, and finishing.
9. Demonstrate the interrelationship of communication graphics and other types of communication.
10. Analyze optic-electric components and lasers.
11. Analyze the application of analog and digital components to computers.
12. Apply computer input/output devices as they relate to various communication techniques.
13. Identify emerging applications of computer languages and artificial intelligence (AL).
14. Describe the industrial need for various computer languages.
15. Demonstrate how computers are related to various systems of communication technology.

CONSTRUCTION TECHNOLOGY CORE COMPETENCIES

The construction technology cluster is designed to give students a better understanding of construction technology. The program provides construction concepts and experiences with tools, materials, and processes used in construction activities, management, and production practices in the construction industry. The suggested instructional units are:

Design	Preparing to Build
Masonry	Wood Frame Construction
Electrical Wiring	Plumbing
Careers in Construction	Maintenance and Repair

Every school offering Industrial Technology should include a construction technology cluster. The Introduction to Industrial Technology Education Construction Cluster (Grades 7 & 8) and Industrial Technology Education I and II (Grades 9 & 10) shall include the following core competencies:

The student shall be given the opportunities, during a 9-week course, to:

1. Describe the three relationships of construction subsystems. These include structure design, personnel management, and the actual building process.
2. Illustrate the different classifications of structures.
3. Use the processes of forming, separating, combining, and conditioning.
4. Investigate space habitat/environmental systems.
5. Use computer software and hardware as a drafting tool to produce technical drawings appropriate to construction processes.
6. Identify types of structural systems.
7. Produce drawings related to the field of construction.
8. Use accepted standards, symbols, and conventions.
9. Design and construct a structure.
10. Research prefabricated systems.
11. Practice simple plumbing techniques.
12. Practice basic masonry techniques.
13. Practice basic electrical wiring techniques.
14. Research the recycling of construction materials.
15. Identify employment opportunities and preparation requirements in a chosen area of the construction industry.

An 18-week course in the Industrial Technology Education Construction Cluster shall include all of the previous competencies plus the following:

1. Identify the types and grades of selected materials used in construction.
2. Determine the criteria for selecting materials for various types of structures.
3. Calculate quantities and cost of construction materials.
4. Use accepted practices for set design, and build structures full size or to scale.
5. Conduct tests to determine the strength of selected simulated structures.
6. Describe the interrelationship between management, personnel, and production practices.
7. Compile local legal requirements and construction documents.
8. Explain the process of remodeling and enlarging structures.
9. Apply automated processes related to construction.
10. Apply the techniques and processes used in manufactured construction products.
11. Explore automated systems used for security and environmental control in building structures.
12. Conduct tests to determine the behaviors of different construction materials under the same specified conditions.
13. Analyze those processes involved in selecting and acquiring a construction site.
14. List new construction materials and methods.

A 36-week course in the Industrial Technology Education Construction Cluster shall include all of the previous competencies plus the following:

1. Illustrate light, heavy, industrial, and civil construction processes and techniques.
2. Organize a construction enterprise to design and build a simulated structure.
3. Describe methods of power conversion/utilization in the residential home.
4. Produce drawings using design principles of style, energy, efficiency, safety, security, and human engineering.
5. Develop structures accurately through the principles of shape and size description.
6. Participate in identifying/surveying corners of a structure.

7. Practice trimming and finishing techniques.
8. Explore remodeling procedures.
9. Discuss contracting and subcontracting practices.
10. Develop a basic knowledge of landscaping.
11. Explore energy conservation principles involved in construction.

ENERGY, POWER AND TRANSPORTATION TECHNOLOGY

The EP&T cluster is designed to acquaint students with power and energy utilization in the transportation industry. Energy is classified as chemical, mechanical, nuclear, radiant, and thermal. The suggested instructional units are:

Basics and Principles of Transportation
Introduction to Energy and Power
Basic Engine Principles and Design
Mechanical Systems
Fluid Power Systems
Electrical Systems
Combined Systems
Solar Energy
Basic Engine Principles and Design
Space Transportation
Water Transportation
Careers in Energy, Power and Transportation

Every school offering Industrial Technology Education should include an Energy, Power and Transportation Cluster. The Introduction to Industrial Technology Energy, Power and Transportation Cluster (Grades 7-8) and Industrial Technology Education I and II (Grades 9-10) shall include the following core competencies:

The student shall be given the opportunities, during a 9-week course, to:

1. Describe the various sources of energy, how they have been used in the past, how they are being used today, and how they will be used in the future.

2. Describe the conversion, control, and application of energy.

3. Conduct experiments in mechanical power. These should include the use of simple machines, mechanical power systems, and power transmission.

4. Explain the differences between exhaustible, renewable, and inexhaustible sources of power.

5. Explain fluid power in terms of theory of operation, parts of a fluid power system, and types of fluid power.

6. Explain electrical power safety, basic laws of electricity, and electrical components.

7. Explain the advantages, disadvantages, and uses of various transportation modes including highway, rail, air, water, and pipeline transportation.

8. Describe the latest advances in power and transportation. This should include the study of solar energy systems and space exploration.

9. Describe robotics' history, applications, and basic operating principles.

10. Study the various careers involved in energy, power and transportation.

11. Construct a transportation vehicle.

An 18-week course in Industrial Technology Education Energy, Power and Transportation Cluster should include all of the previous competencies plus the following competencies:

1. Define basic terms used in energy and power technology.

2. Use formulas to determine work, horsepower, force, and British thermal units.

3. Explain the use of automated control systems including the use of sensors, robots, and computers and their impact on society.

4. Describe transportation in terms of moving passengers and cargo, users of transportation (personal, commercial, and governmental), on-site transportation, and intermodal transportation.

5. Explain the input, process, output, and governmental controls on transportation.

6. Explain the history of external engines. This should include the types of motion produced, types of engines, and power theory.

7. Describe the automotive engine systems and types of engines used in automobiles.

8. Describe the primary parts of a small internal combustion engine, and demonstrate safety while working on a small internal combustion engine.

9. Explain the origins of nuclear power, types of nuclear reactions, and the impact of nuclear power on our society.

10. Describe emerging energy systems and advances in transportation.

A 36-week course in Industrial Technology Education Energy, Power and Transportation Cluster should include all of the previous competencies plus the following competencies:

1. Explain the positive impact that energy, power and transportation has on our environment.

2. Describe the negative impact that energy, power and transportation has on our environment.

3. Describe the methods we use to control pollution.

MANUFACTURING TECHNOLOGY CORE COMPETENCIES

Manufacturing Technology is a study of skills and information used in manufacturing processes. It provides learning experiences that fulfill the growing demand for educational programs which deal with important industrial and manufacturing concepts. The suggested instructional units are:

The History and Development of Manufacturing
Research and Design
Production Systems
Materials and Processes
Computer-Assisted Manufacturing
Industrial Production Management
Careers in Manufacturing

Every school offering Industrial Technology should include a Manufacturing Cluster. The Introduction to Industrial Technology Education Manufacturing Cluster (Grades 7-8) and Industrial Technology Education I and II (Grades 9-10) shall include the following core competencies:

The student shall be given the opportunities, during a 9-week course, to:

1. Define manufacturing.
2. Describe the development of manufacturing.
3. List and explain the three types of production systems.
4. Calculate the quantity and cost of manufacturing materials.
5. Describe the product design process.
6. Draw a set of working drawings for a product.
7. Complete a bill of materials for a product.
8. Explain at least two ways that a computer is useful in product design and engineering.
9. Define production.
10. Name the key ingredients in computer integrated manufacturing.
11. Describe how a robot is used in manufacturing.
12. List and explain job opportunities in the area of manufacturing.
13. Describe careers in other areas that support the manufacturing process.
14. Analyze a product design, and find ways to improve it.

An 18-week course in Industrial Technology Education Manufacturing Cluster should include all of the previous competencies plus the following:

1. Describe the Industrial Revolution and its importance in the development of the manufacturing system.
2. Investigate the types and grades of selected materials used in manufacturing.
3. Identify the major steps in product engineering.
4. Explain the difference between functional design and production design.
5. Name the production design factors.
6. List examples of computer-assisted production processes.
7. Construct a model of a redesigned product.
8. Develop a product survey for a given or developed product.
9. Complete a product survey for a given or developed product.
10. Develop a flow chart for a product to be manufactured.
11. Make a presentation of a product for production approval.
12. Explain the importance of a company choosing a new product carefully.
13. Name and explain the three possible forms of company ownership.
14. Design and build jigs and fixtures to be used in the production of a product.
15. Explain the purpose of a pilot run.
16. Complete a job application form for a manufacturing position.
17. Make a pilot run for a manufacturing product.
18. Mass produce a product.
19. Operate a robotic arm.
20. Design a package for a product.
21. Use a CNC lathe to turn a part.
22. Use a CNC mill to produce a part.
23. Identify the parts of a CNC machine.
24. Identify the parts of a robot.

25. Identify the degrees of freedom on a robot.

26. Write a part program for a CNC machine.

27. Define marketing.

28. Explain how supply and demand affects marketing.

A 36-week course in Industrial Technology Education Manufacturing Cluster shall include all of the previous competencies plus the following competencies:

1. Explain the purpose of a labor union.
2. List future trends in manufacturing.
3. Draw a plant layout for the production of a product.
4. Use a CAD system to complete a set of working drawings.
5. Identify quality assurance procedures.
6. Name at least two ways a company identifies consumer demands.
7. List and explain ways that materials and parts can be moved through a factory.
8. Name the steps in hiring and training workers.
9. Describe what happens during a production run.
10. Set up and operate a computer-assisted materials handling system.
11. Explain the purpose of packaging.
12. Describe how an automated factory works.
13. Define "profit," "loss," and "breaking even."
14. Explain and demonstrate the process of forming.
15. Explain and demonstrate the process of separating.
16. Explain and demonstrate the process of combining.
17. Describe the types of inputs in a production system.
18. Describe the types of outputs in a production system.
19. Describe stocks and shares and their importance in manufacturing.
20. Name the major departments of a company, and define their functions.
21. Describe "just-in-time" manufacturing.

22. Define patent and explain its purpose.

23. Identify tools, machines, and equipment used in manufacturing.

24. Explain the purpose and duties of the Occupational Safety and Health Administration.

25. Identify support services for manufacturing.

SECTION 7

TECHNOLOGY WORD LISTS

COMMUNICATION TECHNOLOGY
WORD LIST

Amplifier - A device that makes a small mechanical force or electrical voltage larger.

Analog - In electronics, a smoothly varying voltage or current that can be set to any desired value, as opposed to digital, which can be set only to a limited number of values (e.g., 1s and 0s in binary form).

ASCII - American Standard Code for Information Interchange. A digital code in which seven binary bits represent letters, numbers, and punctuation.

Audio Communication System - A communication system based on our sense of hearing (e.g., telephones, stereos, and cassette recorders).

Bar Code - Striped code printed on most products; used as a data transfer method.

Bit - The smallest unit of digital information; a "1" or "0" in digital coding.

Broadcast - The sending of a message to many receivers at the same time.

Byte - A group of bits, usually eight, that is used to represent information in digital form.

CAD (Computer-Aided Design) - The use of a computer to assist in the process of designing a part, circuit, building, etc.

Channel - The path that information takes from the transmitter to the receiver.

Code - A set of signals or symbols that have some specific meaning to both the sender of the message and the receiver of the message.

Communication - Successfully sending a message or idea from one person, animal, or machine (the origin) to a second person, animal, or machine (the destination).

Communication Satellite - A device placed into orbit above the earth that receives signals from an earth station and relays them to other earth stations.

Compact Disk - A thin, round disk on which information is stored digitally in the form of pits that reflect or absorb light from a laser.

Computer - Electronic devices that store and process information and sometimes control other machines.

Data - Raw facts and figures. Data may be processed into information.

Demodulation - Process of separating a carrier wave from a signal wave.

Desktop Publishing - The use of a personal computer, special software, a mouse, and a high-quality laser printer to compose entire pages of text and pictures.

Digital - In electronics, the use of a limited number of values of voltage or current to represent information (e.g., 1s and 0s in a binary system).

Disk Operating System (DOS) - A diskette that contains "master" set of programs for a computer.

Down Link - The portion of a satellite communication link from the satellite to the ground station(s).

Drafting - Process of accurately representing three-dimensional objects and structures on a two-dimensional surface, usually paper. Techniques used to produce accurate and precise working drawings.

Electronic Communication - Those methods of communication where the channel uses electrical energy.

Electrostatic Printing - Printing process based on the fact that opposite electrical charges attract, while like charges repel.

Facsimile System - Method of transferring words and pictures as digital information.

Fiber Optics - Tiny strands of glass or plastic that allow sound, information, and control signals to be transmitted in the form of light.

Graphic Communication - Those methods of communication where the channel carries images or printed words.

Hologram - A photograph made using lasers. The final image appears to be three-dimensional.

Integrated Circuit - A complete electronic circuit built on a single piece of semiconductor material. Integrated circuits contain from dozens to over 500,000 transistors and other circuit components. They can perform extremely complex functions.

Kilobyte (K) - A unit of measure representing 1,024 bytes of computer memory.

Laser - Light Amplification by Stimulated Emission of Radiation. A laser is a source of very pure (single color) light that is focused into a very narrow beam.

Logos - Graphic symbols used to represent a company, an idea, or a product.

Mainframe Computer - A large computer used primarily in business, industry, and government.

Mass Media - Communication systems such as magazines, newspapers, radio, and television, that are used to reach large numbers of people.

Microchip - A tiny electronic control device.

Microcomputer - A small computer designed for individual use, also called personal computer.

Microprocessor - A computer's electronic processing device. The microprocessor acts as the brain of the computer.

Microwaves - Very short electromagnetic waves.

Minicomputer - A smaller, less powerful version of a mainframe computer.

Modem - (MODulator-DEModulator) A device used to send data signals over analog communication channels (such as telephone circuits).

Modulation - Process of superimposing a carrier wave on a signal wave.

Negative - A reversed image on photographic film, used for printing pictures.

Network - Information transmitters and two or more receivers connected by channels. A data network connects computers and/or computer devices. A voice network connects telephones. A video network connects television cameras and receivers.

Noise - An imperfection in a communication channel or equipment. Noise makes the message more likely to be misunderstood.

Optical - Having to do with light or sight.

Processes - In communication, things done to communicate.

Random Access Memory (RAM) - The largest portion of a computer's main memory, in which the program is stored while it is being worked on, and in which at least some of the data and results are temporarily stored.

Read Only Memory (ROM) - Computer memory that is installed by the computer manufacturer. Data on this memory system cannot be added to or changed.

Receiver - The part of a communication system that accepts the message from the channel and presents it to the destination.

Supercomputer - A computer vastly superior in size and speed to the mainframe computers in use at any given time. Because of the rapid progress in computer technology, supercomputer performance of yesterday is commonplace today.

Technology - The use of accumulated knowledge to process resources to satisfy human needs and wants.

Telecommunication - Communicating over a long distance.

Teleconference - A meeting conducted by people located at different sites, using communications to link them together. The attendees can use voice only (telephone conference call), voice with still pictures, or full motion pictures and voice (videoconference).

Transmitter - The part of a communication system that accepts the message from the originator and places it on the channel.

Up Link - The part of a satellite communication system from a ground station to the satellite.

Video Photography - Camera system in which images are stored as digital information on computer disks.

Xerography - An electrostatic printing process. It is the most widely used printing method for making single copies.

CONSTRUCTION TECHNOLOGY
WORD LIST

Abutments - Supports at the ends of a bridge.

Active Solar - The use of solar energy to perform a specific task, such as heating water or generating electricity, with the help of mechanical devices such as pumps or fans.

Architect - Person who designs and develops the plans for building structures.

Asphalt - A tarlike substance used to pave roads and produce roof shingles.

Bid - A contractor's best estimate of what it will cost to build a project, plus an amount for profit.

British Thermal Unit - The amount of energy needed to raise the temperature of one pound of water one degree Fahrenheit.

CAD (Computer Aided Design) - The use of a computer to assist in the process of designing a part, circuit, building, etc.

Cement - A construction material made of limestone and clay.

Compacting - Packing the earth to make it firm.

Composite - A synthetic material made of other materials.

Computer Aided Drafting - The use of a computer to assist in the process of creating, storing, retrieving, modifying, and plotting a technical drawing.

Condominium - Type of multifamily housing in which units are privately owned instead of rented.

Construction - The building of a structure on a site.

Contract - A formal agreement between any two people. In construction, the agreement that describes in detail what will be built, when and how it will be paid for, and who assumes risks if something goes wrong.

Contractor - Person who owns and operates a construction company.

Coordination - In construction, the cooperation between two or more groups of people to avoid interference when installing systems in a single building.

Duplex - Two apartments side by side (usually) under a single roof.

Excavate - To dig out.

Foundation - In construction, the portion of a structure that supports its weight; the substructure. The foundation includes the footing and the foundation wall.

Foundation Wall - The part of the foundation above the footing.

Framing - The process of constructing the skeleton of the house.

General Contractor - A person or company who accepts the total and complete responsibility for building a construction project.

Geothermal - An energy source derived from the heat of the earth.

Girder - A strong horizontal structural support made from wood or steel.

Insulation - Material that does not conduct heat or electricity very well.

Intelligent Building - A building with advanced communications capabilities built in to be shared by different tenants.

Landscaping - Altering a site to make it more beautiful.

Level - Surveying device used to make vertical measurements (elevations).

Lien - A charge placed against property for money owed.

Manufactured Housing - Housing that is built in modules in a factory, transported to the construction site, and placed on a foundation where the utilities are installed.

Masonry - Units of stone, brick, or concrete materials.

Mortar - A mushy, cementlike substance that hardens and acts like glue to hold concrete blocks or bricks together.

Mortgage - A loan that is secured by a home, building, or other large physical asset.

National Electrical Code - A set of standards developed by the National Fire Protection Association which establishes safe methods of installing electrical wiring and equipment.

Occupational Safety and Health Administration (OSHA) - Agency of the federal government that sets and enforces safety standards for work sites.

Piers - Vertical structural supports.

Piles - Structural members that are driven into the earth to provide a solid base for a substructure.

Pitch - The amount a roof slopes. It is equal to the number of inches the roof rises vertically for each foot of horizontal span.

Plumb - The condition that exists when a structural element is perfectly vertical.

Plumbing - The systems in a structure that have to do with carrying water and waste materials.

Prefabricate - In construction, to build a building or a portion of it at a location other than the construction site.

Profit - Money a company has left after selling its services or products and paying its expenses.

Rafters - The sloping elements that make up a framed roof.

Sawing - Sawing involves separating material with a blade that has teeth.

Shaping - Processes used to change the shape or contour of materials.

Sheathing - The outer layer of material (often plywood, particleboard, or foamboard) that covers and protects the walls and the roof.

Site - Property on which a structure will be constructed. Also, the exact location of the structure on the property.

Span - Distance between supports on a bridge. Also, to extend across.

Specification - Detailed statement of requirements. In problem solving, a goal is a broad or general statement of requirements, and a specification is a detailed and specific statement of requirements.

Subcontractor - A person or company whose job it is to build a part of a construction project.

Substructure - The base of a structure that supports the superstructure (foundation).

Superstructure - In construction, the part of the structure above the foundation; it is usually the part of the structure that is visible above the ground.

Surveying - Very precise land measurement process.

Technology - The use of accumulated knowledge to process resources to satisfy human needs and wants.

Truss - A framework of wood or metal members fastened together in the shape of a triangle.

Underlayment - Hardboard, plywood, or particleboard placed over the subfloor which provides a base for the finish floor.

Vapor Barrier - A layer of plastic, paper, or foil that covers insulation. It prevents warm, moist air inside the house from condensing on cooler studs, thereby preventing rot.

Wind Load - The effect of wind as it blows against a structure.

ENERGY, POWER AND TRANSPORTATION TECHNOLOGY
WORD LIST

Aerodynamic Drag - The force created by the resistance of air to the movement of a vehicle.

Barge - A type of water transportation vehicle shaped like a large box (lighter).

Batch - Any amount of one material shipped through a pipeline at one time.

Battery - A device that stores energy chemically and converts it to electricity.

Break Bulk Cargo - Single units or cartons of freight.

Cargo - Items that are transported (freight).

Circuit - A group of components connected to perform a function.

Container Ship- A ship that carries freight which is prepacked in containers that are carried to and from the ship on railroad flat cars and trucks.

Containerization - Containerized shipping.

Current - The flow of electrons through a material.

Deregulation - Elimination of government rules that regulate the transportation industry.

Electron - The negatively charged part of an atom that orbits the nucleus. The movement of electrons from one atom to another creates an electric current.

Energy - One of the seven resources used by technological systems. Energy is the capacity for doing work. It takes many forms (thermal, electrical, mechanical, etc.) and comes from many sources (solar, muscle, chemical, nuclear, etc.).

Energy Converter - A device that changes one form of energy into another.

Energy Efficient - Making the best use of available energy.

Engine - A device that converts energy into motion and force.

Fission - The splitting of an atomic nucleus into two smaller nuclei, neutrons, and energy.

Fossil Fuel - A fuel formed from the partially decomposed remains of plants and animals buried in the earth over extremely long periods of time. Examples of fossil fuels include coal, oil, and natural gas.

Friction - The rubbing together of parts that creates a resistance to motion between the parts.

Fusion - The combining of two atomic nuclei into a single nucleus plus a large amount of energy.

Generator - A device that converts rotary motion into electric energy.

Horsepower - A measure of power equal to 550 foot-pounds per second, 746 watts, or 33,000 foot-pounds per minute.

Hydraulics - Using the reaction of fluid under pressure to control motion.

Hydroelectricity - Electricity produced by turbines driven by falling water.

Insulator - A material whose atoms hold their outer electronics tightly, resisting the flow of electrical current through the material.

Intermodal - A transportation system that uses more than one type (mode) of transportation (e.g., ships, railroads, and trucks).

Kinetic Energy - The energy of an object due to its motion.

Lift - The upward force of an object in the air, resulting from its weight and volume (passive lift) or its shape and movement through the air (active lift).

Monorail - A mass transit vehicle that rides on a single rail.

Motor - A machine that uses energy supplied by another source.

Nuclear Energy - Energy derived from the splitting (fission) or combining (fusion) of atoms.

On-Site Transportation - Movement of people or things within one particular area.

Parabolic Reflector - A curved reflector that focuses light, heat, or radio waves on a single point called the focal point.

Passive Solar - Taking the heating effects of the sun into account when designing walls, doors, and window placement in buildings.

Piggyback - The use of railroad flat cars to carry truck trailers.

Pipelines - A series of pipes fastened together through which cargo (such as oil products) is moved.

Pneumatic - Activated by air pressure.

Potential Energy - The energy stored in an object due to its position, shape, or other feature.

Power - The amount of work done in a given period of time; the rate of doing work.

Processes - In communication, things done to communicate. In manufacturing, activities performed to change materials according to a plan. In transportation, the things done to actually cause the movement of passengers and cargo.

Recycle - To reuse all or portions of a substance.

Resistance - The opposition to electrical current flow.

Revolutions Per Minute (RPM) - The number of times a crankshaft in a reciprocating engine turns in sixty seconds.

Rocket Engine - An engine that provides thrust from the rapid expansion of burning fuel and oxygen, which it must carry with it.

SeeBee Ship - A type of barge ship.

Slurry - A rough solution made of a ground up, solid material and a liquid which helps ship the material through a pipeline.

Solar - Coming from the sun.

Solar Cell - A device that converts light.

Superconductor - A material whose electrical resistance suddenly drops to nearly zero at a certain low temperature.

Thermal - Having to do with heat or the transfer of heat.

Thrust - The force developed to move an airplane forward through the air.

Transportation - The movement of people and things using vehicles.

Vehicles - Various means used to transport people and things

Voltage - The force necessary to move electrons from one atom to another in a material.

Watt - A measure of power equal to one kilogram-meter per second. One watt also equals one ampere times one volt.

MANUFACTURING TECHNOLOGY
WORD LIST

Adhesives - Substances such as glue or cement used to bond materials together.

Assemblies - Assembled components.

Assets - Everything that is owned by a person or company.

Automation - The process of controlling machines automatically.

Bill of Materials (BOM) - A complete list of the materials or parts needed to make one product.

CAM - Computer-Aided Manufacturing. The use of computers to control a manufacturing process.

Capital - One of the seven resources used in technological systems. Capital is the money or other form of wealth used to provide the machines, materials, and other resources needed in the system.

Casting - Forming a product by pouring a liquid material into a mold, letting it harden into a solid, and removing it from the mold.

CIM - Computer-Integrated Manufacturing. The use of computers to control both the business and production aspects of a manufacturing facility.

Coating - A combining process used to beautify or protect the surface of a material.

Combining - The joining of two or more materials in one of several ways, including fastening, coating, and making composites.

Company - An organization formed by a group of people for the purpose of doing business.

Component - A part that performs a specific function.

Computer Numerical Control (CNC) - Computer-controlled machine operation based on a numerical code.

Consumers - People who buy products for their own personal use.

Custom Production - Type of production in which products are made one at a time and each is different from the others.

Distribution - Methods used to get goods to the purchaser.

Engineer - A person with an engineering degree and/or a state license who designs buildings, roads, electronic circuits, airplanes, computers, and other technological systems.

Entrepreneur - A person who forms and runs a business that is often based on new ideas and/or inventions.

Extruding - A method of forming parts in which a softened material is squeezed through an opening, giving the part the shape of the opening.

Factory - Building in which goods are manufactured.

Fastening - The process of attaching one part to another.

Final Assembly - The point at which all parts are combined to form the product.

Finished Goods - Products completed but not yet sold.

Fixture - A special device that holds a part in place during processing.

Flexible Manufacturing - A manufacturing process in which the tools and machines can be easily reprogrammed to produce different parts, making it economically feasible to make small quantities of any given part.

Forming - Changing a material's shape without cutting it.

Hardness - The ability of a material to resist being dented or scratched.

Industrial Materials - The intermediate step between primary raw materials and finished products. Primary raw materials are made into industrial materials, which are made into end products.

Industrial Revolution - A period of inventive activity beginning around 1750 in Britain. During this time machines mechanized what had previously been manual work. The Industrial Revolution was responsible for many social changes, as well as changes in the way things were manufactured.

Interchangeability of Parts - When any one of a number of identical parts can be assembled with any one of a number of identical joining parts.

Inventory - The quantity of items on hand.

Jig - A special device that holds a part being processed and guides the tool performing the process.

Job-Lot Production - Type of production in which a limited number of similar products are made.

Just-In-Time Manufacturing - A manufacturing process in which the raw materials and other required parts arrive at the factory just before they are needed in the assembly process.

Manufacturing - The building of products in a workshop or factory.

Marketing - All activities involved in selling products.

Mass Production - The manufacture of many goods of the same type at one time, frequently involving interchangeable parts and the use of an assembly line.

Material Handling - Moving and storing parts and materials.

Mock-Up - A three-dimensional model of a product that looks real but has no working parts.

Modeling - The testing of a problem solution or a system without building the solution or system itself. Modeling includes using small physical replicas of the solution (scale models) and intangible representations of the solution (mathematical models, computer models, etc.).

Mold - A hollow form used to shape materials.

Numerical Control - The control of manufacturing machines by computer commands primarily by punched tape.

Occupational Safety and Health Administration (OSHA) - Agency of the federal government that sets and enforces safety standards for work sites.

Patent - A protection granted by the government that ensures that an inventory's idea cannot legally be copied.

Pilot Run - A practice production run done to find and correct problems before actual production begins.

Processes - In communication, things done to communicate. In manufacturing, activities performed to change materials according to a plan. In transportation, the things done to actually cause the movement of passengers and cargo.

Production - Multi-step process of making parts and assembling parts into products.

Properties of Materials - The characteristics of materials (such as hardness and plasticity) that make them suitable or unsuitable for certain applications.

Prototype - A model of a final product or structure that is built to help evaluate the soundness of a design and to discover unanticipated problems.

Quality Assurance - Methods used to make sure that products are produced according to plans and that products meet all specifications.

Raw Materials - Materials as they occur in nature; natural materials.

Research and Development (R & D) - Processes used to find new ideas and develop them into products.

Robot - A multifunction, reprogrammable machine capable of movement.

Separating - A category of processes that divides or puts apart materials. Separating processes include shearing, sawing, drilling, grinding, shaping, turning, filtering, and chemical and magnetic separation.

Subassembly - An assembly that is used as part of another assembly.

Subsidiaries - Companies owned and controlled by a separate, larger company.

Tolerance - The amount that a given dimension can vary from the design size and still be used.

Tooling-Up - Getting tools and equipment ready for production.

Union - A labor organization representing a group of workers that bargains with employers to set wages and work practices for its members.

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Communication

Technology

UNITS IN COMMUNICATION TECHNOLOGY
RECOMMENDED INSTRUCTIONAL TIME

		9 WKS	18 WKS	36 WKS
1.	Introduction/Overview of Communication Technology	1	2	2
2.	Introduction to Drafting and Design in Communication Technology	1	2	2
2.1	Symbols and Lettering	1	2	5
2.2	Scales Used to Communicate Size	1	2	2
2.3	Freehand Sketching	1	3	3
2.4	Geometry of Technical Drawing	1	2	3
2.5	Multi-view Drawings	1	2	5
2.6	Dimensioning Size and Location		1	5
2.7	Pictorial Drawings	2	3	5
2.8	Computer Aided Drafting (CAD)		2	5
3.	Introduction to Graphic Communication	1	1	2
3.1	Safety	1	1	2
3.2	Types of Graphic Communication	1	2	4
3.3	Layout and Design	1	2	7
3.4	Relief Printing	2	3	7
3.5	Gravure Printing		1	3
3.6	Screen Printing	3	5	5
3.7	Planographic Printing	1	3	7
3.8	Bindery and Finishing	2	2	5
4.	Introduction to Photographic Technology	1	1	3
4.1	The Camera: Application of Basic Photographic Principles	2	3	3
4.2	Operating the 35mm Single Lens Reflex Camera		2	5
4.3	Composition	1	1	2
4.4	Exposure	2	2	4
4.5	Properties of Film and Film Development	1	2	4
4.6	Contact Printing and Enlarging	3	4	5
4.7	Applications of Advanced Photographic Technology		2	4
5.	Introduction to Electronic Communication	1	1	2
5.1	One Way Telecommunication Systems	2	2	4
5.2	Two Way Telecommunication Systems	2	2	4
5.3	Fiber Optics in Communication	1	3	4
5.4	Satellites in Communication	1	1	2
5.5	Lasers in Communication	1	2	4
5.6	Microwave Communication		1	2
5.7	Introduction to Computers	2	3	3
5.8	Computer Software and Hardware	2	3	7
5.9	Computer Theory	1	4	10
5.10	Computer Applications and Impact	1	2	5
5.11	Audio-Video Production Planning		3	5
5.12	Audio-Video Production		4	7
5.13	Impact and Careers in Audio-Video Communication		1	2
	TOTAL HOURS	45	90	180

REFERENCE: 1

MAJOR TITLE: Communication Technology

UNIT TITLE: Introduction/Overview of Communication Technology

MAJOR CONCEPT: Industrial Communication Technology involves many kinds of equipment and methods to convey and share thoughts and ideas.

TOPICS:

1. Five Elements of Communication (sender, channel, message, receiver, and feedback)
2. Communication Technology (tools, materials, and processes)
3. Communication Systems (input, process, output, and feedback)
4. Types of Communication (i.e., Drafting and Design, Graphic Communication, Photographic Communication, and Electronic Communication)
5. Impact of Communication Technology

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Define communication technology, and discuss the impact of modern communication on society.
2. List the five basic elements of the communication process.
3. Identify the three basic types of communication systems.
4. Describe a communication system by its input, process, output, and feedback; and provide at least one practical example.

CORE INSTRUCTIONAL ACTIVITIES:

1. Identify three methods of communicating the message in each of the following forms: audio, visual, and audiovisual.
2. Make a list of all the communication systems you come in contact with during the course of a day.
3. Break down the following communication systems into input, process, output, and feedback:
   a. Radio
   b. Television
   c. Telephone
   d. Telegraph
   e. Teletype
4. Define communication technology as the tools, materials, and processes that people use to enhance their abilities to communicate.
5. Draw a block diagram of a communication system showing the five basic elements of sender, message, channel, receiver, and feedback; and discuss how these elements work together to communicate a message.
6. Identify methods in which technology is used to help people communicate.
7. Explain the basic history and development of at least one communication device, and explain how the particular device has changed the way people communicate and/or what it would be like if we did not have the device.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Identify recent developments in communication technology.
2. Discuss the impact of a communication device, and construct a model from inexpensive materials around the house or the lab.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Overhead Projector With Screen
Chalkboard
VCR System With Camera

MATERIALS/CORE:

Videotapes
Paper
Pencil

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Same

APPLICATIONS OF TERMS:

Sender
Message
Feedback
Communication Technology
Visual Communication System
Process
Noise
Channel
Receiver
Interference
Communication System
Input
Output
Audio Communication System

REFERENCES:

Johnson, C. D., Communication Systems, South Holland, IL: Goodheart-Willcox Co., Inc., 1992.

Jones, Ronald E., and Janet L. Robb, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich, 1986.

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REFERENCE: 2

MAJOR TITLE: Communication Technology

UNIT TITLE: Introduction to Drafting and Design in Communication Technology

MAJOR CONCEPT: Drafting is an essential part of industrial communication.

TOPICS:
1. Language of Industry
2. Career Opportunities
3. Computers in the Field of Drafting

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Describe how drafting communicates ideas.
2. Describe various drafting careers.
3. Explain the impact of computers on the profession of drafting.

CORE INSTRUCTIONAL ACTIVITIES:
1. Discuss how drafting communicates ideas in industry.
2. Observe a teacher demonstration on drafting machines and Computer Aided Drafting (CAD) systems.
3. Discuss how computers have changed drafting.
4. Research and explain two career opportunities in drafting.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Write a paper on a drafting career.
2. Bring in an example of Computer Aided Drafting (CAD).

EVALUATION:
Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
Computer Aided Drafting (CAD) system
Standard Drafting Equipment

MATERIALS/CORE:
None

TOOLS AND EQUIPMENT/ADVANCED:
None

MATERIALS/ADVANCED:
None

APPLICATIONS OF TERMS:

- Drafting
- Technical Illustrator
- Senior Drafter
- Mechanical Drafting
- Checker
- Drafter Trainees
- American National Standard Institute
- Detail Drafting
- CAD
- Design Drafter
- Map Drafter
- Architectural Drafting
- Electrical Drafting

REFERENCES:

Bertoline, Gary R., CAD Applications, Mechanical, Albany, NY: Delmar Publishers, Inc., 1986.

Brown, W. C., Drafting for Industry, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

Goetsch, David L., CAD Applications, Architectural, Albany, NY: Delmar Publishers, Inc., 1986.

Jones, Ronald E., and Janet L. Robb, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich, 1986.

Kicklighter, C. E., Architecture: Residential Drawing and Design, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

Lutz, R. J., Applied Sketching and Technical Drawing, South Holland, IL: Goodheart-Willcox Co., Inc., 1991.

Walker, John R., Exploring Drafting, South Holland, IL: Goodheart-Willcox Co., Inc., 1991.

REFERENCE: 2.1

MAJOR TITLE: Communication Technology

UNIT TITLE: Symbols and Lettering

MAJOR CONCEPTS: Symbols, lines, and letters are the building blocks of drafting.

TOPICS:

1. Symbols
   1.1 Alphabet of lines
   1.2 Finish marks
2. Lettering
3. Tools of drafting

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify drafting symbols and lines.
2. Identify the tools used to prepare a technical drawing.
3. Demonstrate single-stroke, vertical, Gothic freehand lettering.

CORE INSTRUCTIONAL ACTIVITIES:

1. Identify drafting symbols displayed on the monitor of a Computer Aided Drafting (CAD) system or on teacher-prepared handouts.
2. Match the name of the drafting tool with the tool shown by the teacher.
3. Freehand letter a teacher-assigned exercise using single-stroke, vertical, Gothic style capital letters and numbers.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Demonstrate the use of each drafting tool.
2. Draw and label the alphabet of lines.
3. Use the Computer Aided Drafting (CAD) system to generate drafting symbols on the monitor.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE/ADVANCED:

Set of Drafting Tools
Computer Aided Drafting (CAD) System or Handout on Symbols and Lettering

MATERIALS/CORE/ADVANCED:

Drawing Paper

APPLICATIONS OF TERMS:

Lead Holder	Divider	Leader Pointer
Erasing Shield	T-square	Irregular Curve
Scale	30°/60° Triangle	Eraser
Compass	45°/45° Triangle	

REFERENCES:

Brown, W. C., Drafting for Industry, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

Jones, Ronald E., and Janet L. Robb, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich, 1986.

Walker, John R., Exploring Drafting, South Holland, IL: Goodheart-Willcox Co., Inc., 1991.

REFERENCE: 2.2

MAJOR TITLE: Communication Technology

UNIT TITLE: Scales Used to Communicate Size

MAJOR CONCEPT: Different scales are used to measure and graphically communicate the size of such things as manufactured goods, buildings, pipelines, and land.

TOPICS:

1. U.S. Customary Scale (inch scale)
   1.1 Fractions
   1.2 Decimals
2. Metric Scale
3. Architect's Scale
4. Civil Engineer's Scale
5. Mechanical Engineer's Scale

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify
   1.1 the U.S. Customary Scale.
   1.2 the Architect's Scale.
   1.3 the Civil Engineer's Scale.
   1.4 the Mechanical Engineer's Scale.
2. Use an inch scale to measure lines and write the answer to the nearest one eighth of an inch.
3. Be able to express 1/4", 1/2", and 3/4" in decimal form and vice-versa.
4. Measure lines with a metric scale to the nearest millimeter, and express the answer in centimeters/millimeters.

CORE INSTRUCTIONAL ACTIVITIES:

1. Identify each scale (Architectural, U.S. Customary, Civil Engineer's, and Mechanical Engineer's) by writing the correct name under an illustration of each scale on a teacher-prepared handout.
2. Express whole numbers and fractions, i.e., 1 1/2, 4 1/4, and 3 3/4 in their decimal forms, and convert decimals to their nearest fractional equivalents.
3. Measure lines with a U.S. Customary Scale to the nearest 1/16 of an inch.
4. Measure lines with a metric scale to the nearest millimeter, and express the answer in centimeters/millimeters.
5. Determine the size of the classroom using a meter stick, and express the answer to the nearest meter/centimeter.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Measure objects in the classroom using both the metric and inch system.
2. Draw the floor plan of the classroom using the 1/8 or 1/4 architectural scale.
3. Use the correct scale to measure drawings (Architectural, Civil Engineer's, and Mechanical Engineer's), and write the measurements on the drawings.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

U.S. Customary Scale
Metric Scale
Chalkboard and chalk

MATERIALS/CORE:

Prepared Handout Scales
Prepared Handout Lines

TOOLS AND EQUIPMENT/ADVANCED:

Meter Stick
Architectural Scale
Civil Engineer's Scale
Mechanical Engineer's Scale

MATERIALS/ADVANCED:

Paper
Prepared Problems

APPLICATIONS OF TERMS:

Inch	Meter	Centimeter
Fraction	Metric	Architectural Scale
Decimal	Millimeter	Engineering Scale
U.S. Customary		

REFERENCES:

Brown, W. C., Drafting for Industry, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

Jones, Ronald E., and Janet L. Robb, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich, 1986.

REFERENCE: 2.3

MAJOR TITLE: Communication Technology

UNIT TITLE: Freehand Sketching

MAJOR CONCEPT: Ideas can be recorded and conveyed quickly by freehand sketches using only a pencil and paper.

TOPICS:

1. Importance of Freehand Sketching
2. Basic Steps for Making a Sketch (thumbnail, rough, and finished)
3. Sketching Techniques
4. Proportion

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Demonstrate the proper techniques for sketching
   - 1.1 Vertical lines.
   - 1.2 Horizontal lines.
   - 1.3 Inclined lines.
   - 1.4 Circles.
2. Explain the importance and application of sketching in communication.
3. Freehand sketch a product.

CORE INSTRUCTIONAL ACTIVITIES:

1. Verbally explain the importance of freehand sketching.
2. Freehand sketch a 1/2 inch border on a sheet of unlined paper, and divide the area inside the border into four equal spaces. Sketch vertical lines about 1/2 inch apart in one space; in another space, sketch horizontal lines about 1/4 inch apart. In the third space, sketch inclined lines about 3/4 inches apart, and in the remaining space, draw a circle with a 1 1/2 inch radius.
3. Freehand sketch an automobile approximately 8 inches long.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Freehand sketch a classroom desk about 15 cm. high illustrating correct proportion. Measure the height of the sketch, and record it in centimeters.
2. Freehand sketch a floor plan for a communication lab allowing 1 in. to equal about 1 ft.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Pencil

MATERIALS/CORE:

Paper

TOOLS AND EQUIPMENT/ADVANCED:

Pencil

MATERIALS/ADVANCED:
Paper

APPLICATIONS OF TERMS:

Vertical	Inclined	Radius
Horizontal	Proportion	Freehand Sketch

REFERENCES:

Brown, W. C., Drafting for Industry, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

Jones, Ronald E., and Janet L. Robb, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich, 1986.

Lutz, R. J., Applied Sketching and Technical Drawing, South Holland, IL: Goodheart-Willcox Co., Inc., 1991.

REFERENCE: 2.4

MAJOR TITLE: Communication Technology

UNIT TITLE: Geometry of Technical Drawing

MAJOR CONCEPT: Technical drawings are a combination of geometric shapes used to form detailed objects that communicate ideas.

TOPICS:
1. Common Two- and Three-Dimensional Geometric Shapes
2. Geometric terms

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Identify different two and three dimensional geometric shapes.
2. Demonstrate an application of geometric terms. (refer to APPLICATIONS OF TERMS)

CORE INSTRUCTIONAL ACTIVITIES:
1. Match the geometric term with the drawing of two and three dimensional geometric shapes on a teacher-prepared handout.
2. Make a freehand sketch that illustrates each of the following geometric terms: intersecting, perpendicular, tangent, parallel, diameter, radius, and bisect.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Use drafting tools to draw geometric shapes.
2. Locate different geometric shapes on a teacher-provided drawing, and identify them.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Pencil

MATERIALS/CORE:

Handout Illustrating Geometric Forms and Shapes
Handout of Geometric Terms

TOOLS AND EQUIPMENT/ADVANCED:

Drawing Board
T-square
45° x 45° Triangle
30° x 60° Triangle
Compass

MATERIALS/ADVANCED:

Drawing Paper
Handout of Completed Drawing

APPLICATIONS OF TERMS:

- Geometric Construction
- Intersecting Lines
- Diameter
- Tangent
- Isosceles Triangle
- Square
- Angle
- Circumference
- Hexagon
- Ellipse
- Perpendicular Lines
- Acute Angle
- Obtuse Angle
- Equilateral Triangle
- Arc
- Parallel
- Scalene Triangle
- Pentagon
- Vertex
- Right Angle
- Octagon
- Bisect

REFERENCES:

Jones, Ronald E., and Janet L. Robb, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich, 1986.

Lutz, R. J., Applied Sketching and Technical Drawing, South Holland, IL: Goodheart-Willcox Co., Inc., 1991.

REFERENCE: 2.5

MAJOR TITLE: Communication Technology

UNIT TITLE: Multi-view Drawings

MAJOR CONCEPT: Multi-view drawing shows an object from two or more directions and is the most common type of technical drawing used by industry.

TOPICS:
1. Orthographic Projection
2. Selecting Views
3. Placement of Views
4. Precedence of Lines
5. Auxiliary Views
6. Sectional Views

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Name and locate the views of an object shown in a multi-view drawing.
2. Identify objects from multi-view drawings.
3. Explain the need for auxiliary views and sectional views.
4. Recognize the details illustrated by a sectional drawing.

CORE INSTRUCTIONAL ACTIVITIES:
1. Name each view of a multi-view drawing depicted on a teacher-provided handout.
2. Select the object represented by a multi-view drawing from a group of teacher-provided objects.
3. Select objects that would best be described by using a sectional drawing and those requiring an auxiliary view from a group of teacher-provided objects.
4. Select from a group of objects the object illustrated by a teacher-provided sectional drawing.
5. Prepare a freehand sketch of the third view when given a two-view drawing of an object.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Draw a freehand multi-view sketch of an object provided by the teacher.
2. Make a freehand sketch showing an auxiliary view of an inclined surface represented on a multi-view drawing.
3. Make the required changes to illustrate a sectional drawing, as determined by a cutting plane line, when given a two-view drawing with internal details shown by hidden lines.
4. Use a Computer Assisted Drafting (CAD) System to generate a multi-view representation of an object.

EVALUATION:
Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
Several Different-Shaped Objects

MATERIALS/CORE:
Prepared Multi-View and Sectional Drawings

TOOLS AND EQUIPMENT/ADVANCED:
Several Different-Shaped Objects
Computer Assisted Drafting (CAD) System

MATERIALS/ADVANCED:
Multi-View Drawing With One View Missing
Multi-View Drawing With an Inclined Surface
Two-View Drawing Suitable for Sectioning

APPLICATIONS OF TERMS:

Multi-view Drawing	Principal Views	Projection Lines
Orthographic Projection	Working Drawing	Auxiliary View
Cutting Plane Line	Section Lines	Sectional View

REFERENCES:
Brown, W. C., Drafting for Industry, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

REFERENCE: 2.6

MAJOR TITLE: Communication Technology

UNIT TITLE: Dimensioning Size and Location

MAJOR CONCEPT: Dimensions are added to a drawing to explain size and location of features.

TOPICS:
1. Determining Size and Location
2. Elements of Dimensioning
3. Practices and Rules of Dimensioning

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Identify size dimensions and location dimensions.
2. Measure an object and place the dimensions in their proper locations on a multi-view drawing.
3. Read dimensions on a multi-view drawing, then use a scale to select from a group of objects the one depicted in the drawing.

CORE INSTRUCTIONAL ACTIVITIES:
1. Circle the size dimensions, and place an asterisk beside the location dimensions on a teacher-supplied, fully dimensioned multi-view drawing.
2. Measure the object depicted on a multi-view drawing with no dimensions, and write the dimensions on the drawing.
3. Use a scale to measure objects, and locate the object depicted in a fully dimensioned multi-view drawing.
4. Cut a styrofoam or wood model of the object shown in a fully dimensioned multi-view drawing.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Make a fully dimensioned multi-view drawing from a dimensioned pictorial drawing.
2. Measure a given object; draw and dimension a multi-view drawing of the object.
3. Produce a fully dimensioned multi-view drawing using the Computer Assisted Drafting (CAD) System.

EVALUATION:
Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
Scales
Objects
Keyhole Saw
Un-Dimensioned Multi-View Drawing
Completed Multi-View Drawing

MATERIALS/CORE:
Styrofoam or Wood

TOOLS AND EQUIPMENT/ADVANCED:
Drawing Board
Computer Assisted Drafting (CAD) System
Drawing Instruments
Dimensioned Pictorial Drawing
Dimensioned Multi-View Drawing

MATERIALS/ADVANCED:
Drawing Paper
Masking Tape

APPLICATIONS OF TERMS:

Dimension	Dimension Lines	Leaders
Dimensioned	Extension Lines	Aligned
Arrowheads	Unidirectional	Location

REFERENCES:
Jones, Ronald E., and Janet L. Robb, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich, 1986.

REFERENCE: 2.7

MAJOR TITLE: Communication Technology

UNIT TITLE: Pictorial Drawings

MAJOR CONCEPT: Pictorial drawings give a three-dimensional representation of objects.

TOPICS:

1. Isometric
2. Oblique, Cabinet, and Cavalier
3. Perspective
4. Exploded or Assembly

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Draw an isometric from a multi-view drawing.
2. Draw two oblique drawings illustrating both the cabinet and cavalier methods.
3. Prepare a perspective drawing from an isometric drawing.
4. Sketch an exploded view of an object shown in isometric.
5. Sketch an object from its exploded view.

CORE INSTRUCTIONAL ACTIVITIES:

1. Identify each of the following drawings: isometric, oblique, perspective, and exploded, on a teacher-prepared worksheet.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Prepare a pictorial using each of the methods discussed in class.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Drawing Board
T-Square
30°/60° triangle
45°/90° triangle

MATERIALS/CORE:

Teacher Worksheet
Pencil
Paper
Masking Tape

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Same

APPLICATIONS OF TERMS:

Pictorial	Isometric	Isometric Lines
Oblique	Perspective	Non-isometric Lines
Development	Horizon Line (HL)	Vanishing Point (VP)

REFERENCES:

Jones, Ronald E., and Janet L. Robb, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich, 1986.

REFERENCE: 2.8

MAJOR TITLE: Communication Technology

UNIT TITLE: Computer Aided Drafting (CAD)

MAJOR CONCEPT: Computer Aided Drafting (CAD) is one of the most modern tools of technical design communication.

TOPICS:

1. Terminology of Computers/Computer Aided Drafting (CAD)
2. Components of Computer Aided Drafting (CAD)
3. Applications of Computer Aided Drafting (CAD)
4. Using a Computer Aided Drafting (CAD) System

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Define the terms used in processing information with a Computer Aided Drafting (CAD) system from a teacher-given list.
2. Describe how to use the computer keyboard, digitizer, mouse, and plotter to process given information on the Computer Aided Drafting (CAD) system.
3. Use the Computer Aided Drafting (CAD) system to produce a multi-view drawing.

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss teacher-prepared handouts on Computer Aided Drafting (CAD) components.
2. Discuss the use of the computer keyboard, digitizer, mouse, and plotter.
3. View a Computer Aided Drafting (CAD) demonstration.
4. Using your Computer Aided Drafting (CAD) program, demonstrate geometric construction.
5. Produce a multi-view drawing using the Computer Aided Drafting (CAD) system.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Participate in exercise on the Computer Aided Drafting (CAD) system by following user's guide and as demonstrated by the instructor.
2. Make a three-view draft of a pictorial drawing using the Computer Aided Drafting (CAD) system.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Computer Aided Drafting (CAD) system

MATERIALS/CORE:

Handouts
Documentation for Computer Aided Drafting (CAD)

TOOLS AND EQUIPMENT/ADVANCED:
Same

MATERIALS/ADVANCED:
Same

APPLICATIONS OF TERMS:

Computer Aided Drafting (CAD)	Computer
Keyboard	Digitizer
Plotter	Software
Hardware	

REFERENCES:

Jones, Ronald E., and Janet L. Robb, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich, 1986.

Kicklighter, C. E., Architecture: Residential Drawing and Design, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

Walker, John R., Exploring Drafting, South Holland, IL: Goodheart-Willcox Co., Inc., 1991.

REFERENCE: 3.0

MAJOR TITLE: Communication Technology

UNIT TITLE: Introduction to Graphic Communication

MAJOR CONCEPT: The purpose of graphic communication is to develop products that will communicate visually.

TOPICS:
1. History of Graphic Communication
2. Graphic Printing Processes (relief, gravure, screen/stencil, planographic, photographic, and electrostatic)
3. Careers in Graphic Communication
4. Contributions of Graphic Communication (visual communication, printed media, advertising, and reproduction)

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Name the six major categories of printing.
2. List and describe developments in printing.
3. Identify various careers in the printing industry.

CORE INSTRUCTIONAL ACTIVITIES:
1. Develop a time line of printed materials showing progression and advancements in graphic communication.
2. Discuss the printing processes: relief, gravure, screen/stencil, planographic, photographic, and electrostatic.
3. Produce a list of graphic communication items found in the classroom.
4. Demonstrate use of computer software to create an element of graphic communication. (poster, card, or banner)

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Use the computer and create a piece of graphic communication utilizing a graphics-based computer software program.
2. Print the graphic communication using electrostatic printing.
3. Research information in graphic communication careers.
4. Communicate a graphic idea using the communication system. (input, process, output, and feedback)

EVALUATION:
Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
Computer

MATERIALS/CORE:
Graphics-Based Computer Software Program

TOOLS AND EQUIPMENT/ADVANCED:
Electrostatic Printer
Word Processing Computer Program

MATERIALS/ADVANCED:
Research Format

APPLICATIONS OF TERMS:

Graphic Communication	Planographic	Designer
Relief	Photographic	Photographer
Gravure	Electrostatic	Writer
Screen/Stencil	Illustrator	Editor
Press Operator	Compositor	Reporter
Camera Operator	Platemaker	Guttenburg
Bindery Workers	Production Workers	

REFERENCES:

Documentation for computer software - furnished with software.

Johnson, C. D., Communication Systems, South Holland, IL: Goodheart-Willcox Co., Inc., 1992.

Jones, Ronald E., and Janet L. Robb, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich, 1986.

Prust, Z. A., Graphic Communications, South Holland, IL: Goodheart-Willcox Co., Inc., 1989.

Walker, John R., Graphic Arts Fundamentals, South Holland, IL: Goodheart-Willcox Co., Inc., 1992.

REFERENCE: 3.1

MAJOR TITLE: Communication Technology

UNIT TITLE: Safety

MAJOR CONCEPT: Safety is an important aspect of graphic communication.

TOPICS:
1. General Laboratory Safety
2. Safety Tour of the Laboratory
3. Proper Usage and Storage of Chemicals and Solvents

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Pass a laboratory safety test with a minimum score of 85%.
2. Locate and describe potential hazards associated with equipment and storage areas.
3. Distinguish between safe and unsafe actions in the lab.

CORE INSTRUCTIONAL ACTIVITIES:
1. After a safety discussion the students will assist the instructor in developing class safety rules and procedures for documentation.
2. Design a safety bulletin board for the graphic communications lab.
3. Take a safety test.
4. Use or observe the use of a CO_2 or dry chemical fire extinguisher.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Develop safety posters for the graphic communication area to be displayed around the lab.
2. Analyze the potential hazards using a "Safety Procedures Analysis Technique."
3. Develop an accident prevention program for the graphic communication lab.
4. Design a safety form to use for reporting safety violations.

EVALUATION:
Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
Overhead Projector
Transparencies
Fire Extinguisher
Metal Tray
Safety Glasses

MATERIALS/CORE:
Safety Equipment Common to Lab Areas

TOOLS AND EQUIPMENT/ADVANCED:
None

MATERIALS/ADVANCED:

Poster Board
Markers
Stencils
Meter Stick

APPLICATIONS OF TERMS:

Safety Guards
Personal Safety
Fire Extinguisher
Safety Glasses
General Safety
Classes of Fires
Machine and Tool Safety

REFERENCES:

Hammer, Willie, Occupational Safety and Health Engineering, Prentice-Hall, 1986.

Jones, Ronald E., and Janet L. Robb, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich, 1986.

Prust, Z. A., Graphic Communications, South Holland, IL: Goodheart-Willcox Co., Inc., 1989.

State Department of Education Safety Guide (Transparencies).

Walker, John R., Graphic Arts Fundamentals, South Holland, IL: Goodheart-Willcox Co., Inc., 1992.

REFERENCE: 3.2

MAJOR TITLE: Communication Technology

UNIT TITLE: Types of Graphic Communication

MAJOR CONCEPT: There are six major types of multiple-copy graphic communication.

TOPICS:

1. Relief
2. Gravure
3. Photographic
4. Screen/Stencil
5. Planographic
6. Electrostatic

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. List six major types of graphic reproduction.
2. Explain the processes that are used with each method of reproduction.
3. Perform the following methods of graphic reproduction: relief, gravure, photographic, screen/stencil, planographic, and electrostatic.

CORE INSTRUCTIONAL ACTIVITIES:

1. Observe a teacher demonstration of relief printing. (rubber stamp and ink pad to produce a copy on paper)
2. Observe a teacher demonstration of gravure printing by taking a piece of plastic and scratching it with a stylus to produce a copy on paper.
3. Observe a teacher demonstration of making a photogram to demonstrate photographic methods.
4. Observe a teacher demonstration of screen printing using a paper stencil to produce a copy on paper.
5. Observe a teacher demonstration of planographic printing using a spirit master.
6. Observe a teacher demonstration of electrostatic printing using the school copier.
7. Rotate through each of the six areas demonstrated by the instructor, and produce a copy using each method.
8. Develop a notebook to place all graphic communication work in. The first section will be represented with the copies that you have produced.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Develop a technological assessment form to evaluate the impact of the major graphic reproduction processes. (people, information, materials, tools and machines, energy, capital, and time)
2. Apply the assessment form to any of the six areas. (relief, gravure, photographic, screen/stencil, planographic, and electrostatic)
3. Research an area of graphic reproduction and complete a written report or oral presentation to the class.
4. Utilize a computer and a word processing program, and produce a copy that will be reproduced either on the spirit duplicator or by using the electrostatic process.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Rubber Stamp	Ink Pad	Stylus
Brayer	Pin-Hole Camera	Glass Plates
Screen Print Framer	Squeegee	Duplicator
Copier	X-Acto Knife	

MATERIALS/CORE:

Paper
Water Soluble Inks
Spirit Master
Developing Chemicals

TOOLS AND EQUIPMENT/ADVANCED:

None

MATERIALS/ADVANCED:

Computer Software

APPLICATIONS OF TERMS:

Relief	Gravure	Photographic
Screen/Stencil	Planographic	Electrostatic
Rubber Stamp	Ink Pad	Stylus
Brayer	Pin-Hole Camera	Glass Plate
Screen Print Frame	Squeegee	Duplicator
Copier	Spirit Master	Water Soluble Inks
Dektol	Fixer	Stop Bath
D-76 Developer	Tongs	

REFERENCES:

Jones, Ronald E., and Janet L. Robb, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich, 1986.

Prust, Z. A., Graphic Communications, South Holland, IL: Goodheart-Willcox Co., Inc., 1989.

Walker, John R., Graphic Arts Fundamentals, South Holland, IL: Goodheart-Willcox Co., Inc., 1992.

Word Processing Program.

REFERENCE: 3.3

MAJOR TITLE: Communication Technology

UNIT TITLE: Layout and Design

MAJOR CONCEPT: 205
Layout and design helps create well-designed images for graphic reproduction.

TOPICS:
1. Definition of Layout (formal, informal, symmetrical, and asymmetrical)
2. Elements of Design (balance, contrast, rhythm, unity, and proportion)
3. Cropping
4. Printer's Layout
5. Pasteup

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Define layout and printer's layout. (formal, informal, symmetrical, and asymmetrical)
2. Define the five elements of design. (balance, contrast, rhythm, unity, and proportion)
3. Create thumbnail sketches implementing the elements of design and layout. (i.e., an assigned offset job)
4. Create rough sketches implementing the elements of design and layout. (i.e., an assigned offset job)
5. Properly crop a photograph.
6. Lay out a single page using straight type.
7. Lay out a page that includes both straight type and a photograph.
8. Create a pasteup using the elements of design and printer's layout.

CORE INSTRUCTIONAL ACTIVITIES:
1. Collect examples of the five elements of design, and paste them into the graphics notebook.
2. Discuss layout and printer's layout. (formal, informal, symmetrical, and asymmetrical)
3. Discuss the five elements of design. (balance, contrast, rhythm, unity, and proportion)
4. Develop five thumbnail sketches of a graphic communication job utilizing the five elements of design to plan a layout.
5. Develop two rough sketches of a graphic communication job utilizing the five elements of design to plan a full-size layout.
6. Copy fit a comprehensive layout from the rough sketches.
7. Crop a photograph using a proportional scale.
8. Design a single page layout using straight type.
9. Design a single page layout using straight type and a photograph.
10. Design a pasteup of a graphic communication job on a piece of illustration board. (Adhere the typeset copy using wax.)

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Design a two-page comprehensive layout using straight type and photographs.
2. Use a phototypesetter to design a comprehensive layout.

3. Develop a set of thumbnail sketches for a new product, then refine them to get a printer's layout.
4. Develop a comprehensive layout using a computer and desktop publishing computer software. This will provide "copy ready" artwork.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Line Gauge	Hot Type	Transfer Letters
X-Acto Knife	T-Square	45-Degree Angle
Scale	Correction Fluid	Inking Pen
Hot Wax Machine	Paper Cutter	

MATERIALS/CORE:

Paper	India Ink	Art Gum
Poster Board	Wax	Rubber Cement
Illustration Board		

TOOLS AND EQUIPMENT/ADVANCED:

Computer
Phototypesetter
Desktop Publishing Software

MATERIALS/ADVANCED:

Same

APPLICATIONS OF TERMS:

Formal Balance	Display Type	Compositor
Informal Balance	Text Type	Hot Type
Contrast	Foundry Type	Thumbnail Sketch
Rhythm	Rough Sketch	Cold Type
Unity	Transfer Letters	Comprehensive Layout
Cropping	Proofreading	Line Gauge
Pasteup	Typeface	Camera Ready
Pica	Point	Proportional Scale
Phototypesetter	Typesetting	Hot Wax Machine
Paper Cutter		

REFERENCES:

Jones, Ronald E., and Janet L. Robb, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich, 1986.

Walker, John R., Graphic Arts Fundamentals, South Holland, IL: Goodheart-Willcox Co., 1992.

REFERENCE: 3.4

MAJOR TITLE: Communication Technology

UNIT TITLE: Relief Printing

MAJOR CONCEPT: Relief printing is a process of transferring ink from a raised surface to another surface.

TOPICS:

1. Definition of Relief
2. Letterpress
3. Linoleum Block Printing
4. Flexography

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Set and print with foundry type.
2. Create samples of different relief printing processes.
3. Cut and print with a linoleum block.
4. Make a rubber stamp.
5. List and define relief printing processes.
6. Calculate the most efficient method to cut standard paper to a given size, and cut the number of pieces required for a job.

CORE INSTRUCTIONAL ACTIVITIES:

1. Carve initials in a potato using a paring knife, then use an ink pad and produce basic relief printing.
2. Cut paper stock for making business cards.
3. Print a business card using foundry type and a platen press.
4. Develop a linoleum block print by carving out linoleum with linoleum gouges. Print the carving using a proof press, brayer, and water soluble inks.
5. Experiment with different colors of ink and different colored paper using the linoleum block.
6. Develop a rubber stamp using cold type and a heating unit to heat the rubber and form a rubber stamp. (Mount rubber stamp on a block of wood, then use a stamp pad to produce copies.)
7. Mount examples of four types of relief printing in a notebook.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Incorporate relief printing with another printing process, and make copies.
2. Develop a relief process using more than one color having acceptable registry.
3. Print on other media besides paper using a relief process.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Proof Press	Platen Press	Heat Transfer Machine
Brayer	X-Acto Knife	Foundry Type
Cold Type	Job Case	Paring Knife
Line Gauge	Paper Cutter	

MATERIALS/CORE:

Water Soluble Inks	Stamp Pads	Paper
Linoleum	Wood	Glue

TOOLS AND EQUIPMENT/ADVANCED:
Same

MATERIALS/ADVANCED:
Same

APPLICATIONS OF TERMS:

Linoleum	Block Printing	Platen Press
Proof Press	Brayer	Foundry Type
Line Gauge	Registry	Heat Transfer Machine
Rubber	Flexography	Letterpress

REFERENCES:

Johnson, C. D., Communication Systems, South Holland, IL: Goodheart-Willcox Co., Inc., 1992.

Jones, Ronald E., and Janet L. Robb, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich, 1986.

REFERENCE: 3.5

MAJOR TITLE: Communication Technology

UNIT TITLE: Gravure Printing

MAJOR CONCEPT: Gravure printing is the printing process that involves printing from a depressed surface.

TOPICS:

1. Gravure Printing Process
2. Drypoint Etching

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Explain the gravure printing process.
2. Demonstrate the gravure printing process through drypoint etching.
3. Print using a drypoint etching.
4. Identify the application of gravure printing in today's printed material.

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss the gravure printing process.
2. Create a drypoint etching using a stylus to scratch a piece of plastic to create a gravure plate.
3. Use an oil-based ink and a brayer ink to ink the gravure plate, and use a cloth to remove the excess ink.
4. Print with a proof press and the gravure plate, and create a print.
5. Demonstrate engraving a piece of plastic with a Computer Numeric Control (CNC) milling machine to create a gravure plate.
6. Mask off an aluminum plate, and acid etch a design for gravure printing.
7. Print using the plate created on the Computer Numeric Control (CNC) milling machine or by acid etching, using the proof press.
8. Prepare the examples of gravure printing for display in the student notebook.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Create a gravure plate using the Computer Numeric Control (CNC) milling machine or by acid etching.
2. Print examples of the gravure process using the prepared plate.
3. Print on plastic and different types of paper, using different colored inks, to illustrate different applications of the gravure process.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Stylus
Proof Press
Brayer
Computer Numeric Control (CNC) Milling Machine

MATERIALS/CORE:

Plexiglass 1/8"
Paper
1/8" Piece of Aluminum 4" x 4"
Water-based Inks
Plastic Sheeting

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Same

APPLICATIONS OF TERMS:

Gravure	Brayer	Proof Press
Rotogravure	Drypoint Etch	Diffusion Etch
Solvent	Package Printing	Water-based Inks
Computer Numeric Control (CNC) Milling Machine		

REFERENCES:

Jones, Ronald E., and Janet L. Robb, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich, 1986.

REFERENCE: 3.6

MAJOR TITLE: Communication Technology

UNIT TITLE: Screen Printing

MAJOR CONCEPT: Screen printing is a process whereby ink is transferred through a screen onto the object being printed.

TOPICS:

1. Stencils
2. Screens
3. Screen Printing Process
4. Inks
5. Applications of the Screen Process

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Explain the process of screen printing.
2. Design a stencil for screen printing.
3. Cut a stencil and apply it to the screen.
4. Demonstrate competencies by completing steps in making three individual screen prints.
5. Print on three different types of surfaces. (cloth, paper, glass, plastic, metal, etc.)
6. Participate in mass production project to produce T-shirts.
7. Mount a screen to a frame.

CORE INSTRUCTIONAL ACTIVITIES:

1. Cut a paper stencil out of wax paper using an X-Acto knife.
2. Mount the paper stencil to a frame and block out the screen.
3. Mount a screen to the frame.
4. Print with the paper stencil using water soluble ink.
5. Cut a lacquer stencil using an X-Acto knife, and adhere it to a screen.
6. Print using the lacquer stencil and two different types of ink on a minimum of two different media.
7. Clean screens and prepare them for storage.
8. Design, using a thermal stencil, a T-shirt that will be mass produced in the lab.
9. Save a sample of each type of screen printing, and label it to be included in the notebook.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Screen print using two different colors, and get acceptable registry on two different media.
2. Develop a photo stencil using an ortho-negative of the original design.
3. Print using a screen and the photo stencil after it has been blocked out.
4. Design a heat transfer image.
5. Screen the design on transfer paper using plastisol ink.
6. Heat set the ink.
7. Adhere the design to a T-shirt.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Screen Frame	Squeegee	X-Acto Knife
Brush	Thermal Fax Copier	

MATERIALS/CORE:

Water-based Ink	Textile Ink	Thermal Stencil
Wax Paper	Lacquer Stencil	Stapler/Staples
Block Out	Masking Tape	T-Shirt
Paper	Cloth	Drawing Fluid
Freezer Paper		

TOOLS AND EQUIPMENT/ADVANCED:

Iron	Thermal Lamp	Light

MATERIALS/ADVANCED:

Pre-sensitized Film	Developer	Plastisol Ink
Transfer Paper	Mineral Spirits	Lacquer Thinner
Cloth		

APPLICATIONS OF TERMS:

Screen Fabric	Fabric Cord	Water-based Ink
Screen Frame	Block Out	Plastisol Ink
Kerf	Mass Production	Thermal Stencil
Squeegee	Transfer Paper	Pre-sensitized Film
X-Acto Knife	Lacquer Film	Masking Tape
Paper Stencil	Substrate	Mineral Spirits
Sizing	Liquid Tusche	
Lacquer Thinner	Ortho-Positive	

REFERENCES:

Farrar, Patti, Cite, "Thermal Silkscreen Printing," Muncie, IN: Baltimore State University, CM-R-009, 1987.

Goetsch, David L., and John A. Nelson, Technology and You, Albany, NY: Delmar Publishers, 1987.

Jones, Ronald E., and Janet L. Robb, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich, 1986.

REFERENCE: 3.7

MAJOR TITLE: Communication Technology

UNIT TITLE: Planographic Printing

MAJOR CONCEPT: Planographic printing is a reproduction process using a flat surface plate.

TOPICS:
1. Planographic Printing Process
2. Direct Image Transfer
3. Indirect Image Transfer

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Define direct image transfer.
2. Identify three types of direct image transfer. (electrostatic, photographic copy, and line copy)
3. Define indirect image transfer.
4. Develop an offset print using planography.
5. Use a computer for layout.
6. Identify and explain the five major components of an offset press unit. (feeding system, delivery system, inking system, dampening system, and printing system)

CORE INSTRUCTIONAL ACTIVITIES:
1. Discuss reproduction process.
2. Use a computer to lay out a spirit master that will be duplicated using a duplicator to carry out offset printing.
3. Identify the inking, main printing, feeding, delivery, and transfer process using a spirit duplicator.
4. Using a publishing program and a computer, develop a newsletter to be taken home to the parents describing the communication unit.
5. Use the thermofax machine, and burn a stencil for the spirit duplicator.
6. Print an industrial technology newsletter using the spirit duplicator.
7. Develop a direct image transfer using a piece of glass and a crayon.
8. Ink a direct image transfer with water-based ink, and print on paper using the planographic process.
9. Mount an example of each type of planographic system to be displayed in the student notebook.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Lay out an offset job using the principles of design.
2. Use the process camera, and shoot and develop a negative.
3. Take goldenrod and mask out the negatives.
4. Opaque the negative using an opaque solution.
5. Make an offset plate using a platemaker.
6. Process the plate with desensitizer.
7. Print on paper the product using an offset press with an ink fountain.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Computer	Spirit Duplicator
Brayer	Thermofax Machine

MATERIALS/CORE:

Crayon	Glass	Ink
Duplicating Master	Duplicating Fluid	Thermofax Master

TOOLS AND EQUIPMENT/ADVANCED:

Offset Press	Light Table	Platemaker
Process Camera	T-Square	X-Acto Knife

MATERIALS/ADVANCED:

Offset Plate	Film	Ortho-Film
Developer	Stop Bath	Fixer
Goldenrod	Desensitizer	Paper
Ink	Blanket Wash	Solvents

APPLICATIONS OF TERMS:

Photoconversion	Ground Glass
Stripping	Spirit Master
Spirit Duplicator	Computer
Brayer	Crayon
Thermofax	Offset Plate
Direct Image Transfer	Indirect Image Transfer
Process Camera	Safelights
Developer	Stop Bath
Fixer	Emulsion
Opaque	Process Gum
Desensitizer	Negative
Solvents	Delivery System
Inking System	Dampening System
Printing System	Feeding System
Stock	Registry

REFERENCES:

Goetsch, David L., and Nelson, John A., Technology and You, Albany, NY: Delmar Publishers, 1987.

Hacker, Michael, and Robert Barden, Technology in Your World, Albany, NY: Delmar Publishers, 1987.

Jones, Ronald E., and Janet L. Robb, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich, 1986.

REFERENCE: 3.8

MAJOR TITLE: Communication Technology

UNIT TITLE: Bindery and Finishing

MAJOR CONCEPT: The final process of graphic communication involves binding and finishing the product.

TOPICS:
1. Binding Processes
2. Finishing Processes

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Identify seven binding methods. (mechanical, loose-leaf, wire stitch, sewn soft cover, perfect, and padding)
2. Identify nine methods of finishing a graphic product. (cutting, folding, scoring, perforating, gathering, punching/drilling, die cutting, hot stamping, laminating)
3. Incorporate one of the printing processes to produce a notepad that will be finished and bound.
4. Bind a notebook.
5. Finish a notebook utilizing one of the finishing processes.

CORE INSTRUCTIONAL ACTIVITIES:
1. Identify teacher-provided examples of seven binding processes.
2. Identify teacher-provided examples of nine finishing processes.
3. Define the binding and finishing processes.
4. Utilize the computer, and design a cover for the graphic communication notebook.
5. Laminate the cover using a laminating machine to carry out a finishing process.
6. Bind the notebook together using a three-hole punch, and put it in a ring binder.
7. Print thirty sheets for a notepad using a printing process.
8. Cut a piece of cardboard and the thirty sheets to a standard size using a paper cutter.
9. Bind the notepad together using an adhesive.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Prepare a cover for magazines to be bound using a gold press-on letter.
2. Utilize the computer to design the cover for magazines that are going to be bound.
3. Drill the collection of magazines that are going to be bound.
4. Laminate the cover for the magazine collection.
5. Join the magazines and the cover together using the side sewing method.
6. Apply an adhesive-type binding to the outer edge of the magazine collection.
7. Use a plastic binder to bind instructional sheets together for the instructor.
8. Generate a card that has to be folded using the computer and a publishing program.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

- Computer
- Laminating Machine
- Clamp for Note Pads
- Paper Cutter
- Three-Ring Hole Punch

MATERIALS/CORE:

- Printed Sheets
- Adhesive
- Publishing Program
- Three-Ring Binder
- Padding
- Brush
- Laminating Film
- Cardboard

TOOLS AND EQUIPMENT/ADVANCED:

- Plastic Binding Machine
- Drill Press

MATERIALS/ADVANCED:

- Plastic Binder
- Gold Press-On Letters
- Adhesive Binding
- Needle
- Nylon Thread

APPLICATIONS OF TERMS:

- Binding
- Mechanical
- Wire Stitch
- Sew Case Bond
- Padding
- Folding
- Perforating
- Punching/Drilling
- Hot Stamping
- Backbone
- Brush
- Needle
- Plastic Binder
- Side Sewing
- Side Stitching
- Finishing
- Loose-Leaf
- Sewn Soft Cover
- Perfect
- Cutting
- Scoring
- Gathering
- Die Cutting
- Laminating
- Adhesive
- Hole Puncher
- Nylon Thread
- Binding Machine
- Saddle Sewing
- Saddle Stitching

REFERENCES:

Goetsch, David L., and John A. Nelson, Technology and You, Albany, NY: Delmar Publishers, 1987.

Jones, Ronald E., and Janet L. Rob, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich, 1986.

REFERENCE: 4.0

MAJOR TITLE: Communication Technology

UNIT TITLE: Introduction to Photographic Technology

MAJOR CONCEPT: Photography uses light to convey an image to a photosensitive material.

TOPICS:

1. Light
2. Photosensitive Material
3. Cameras
4. Darkroom
5. Basic Chemical Processes (Black and White)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify five basic elements of photography (light, photosensitive material, camera, darkroom, and chemical processes), and briefly describe how they interact.
2. Identify the primary function of a camera.
3. Identify two categories of photosensitive materials (photographic film and photographic paper).
4. Identify two common uses for a photographic darkroom.
5. Identify the three major chemical processes involved in developing black and white photographic films and papers (development, stop bath, and fix).

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss the procedures used to create photograms. Create a minimum of two photograms using found objects.
2. Develop a minimum of two photograms using standard print development techniques. Evaluate the finished products and discuss the results.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Experiment with making photograms using photographic papers of various grades, weights, surface textures, and tonal qualities. Evaluate and discuss the results.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Enlarger
Bulk Film Loader
Print Washer
Print Tongs
Safe Light
Easel
Contact Printer

Processing Trays (4)
Scissors
Drying Rack
Thermometer
Timer

MATERIALS/CORE:

Photographic Paper	Processing Chemicals
Bulk Film	Masking Tape
Film Canisters	

Selection of Objects (found at home or school)

TOOLS AND EQUIPMENT/ADVANCED:
Same

MATERIALS/ADVANCED:
Same

APPLICATIONS OF TERMS:

Photosensitive Material	Develop
Photographic Paper	Developer
Photographic Film	Stop Bath
Light Tight	Indicator Stop Bath
Darkroom	Fix
Changing Bag	Photogram
Resin-Coated Paper	Canister
Fiber-Based Paper	Bulk Film

REFERENCES:

Seymour, Richard D., Exploring Communications, South Holland, IL: Goodheart-Willcox Company, Inc., 1987.

Walker, John R., Graphic Arts Fundamentals, South Holland, IL: Goodheart-Willcox Company, Inc., 1992.

Walker, R. J., and R. E. Walker, Exploring Photography, South Holland, IL: Goodheart-Willcox Co., Inc., 1991.

REFERENCE: 4.1

MAJOR TITLE: Communication Technology

UNIT TITLE: The Camera: Application of Basic Photographic Principles

MAJOR CONCEPT: Quality photography requires application of basic photographic principles and camera operations.

TOPICS:
1. Principles of Camera Operations
2. Basic Parts of the Camera
3. Types of Cameras

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Explain the operation of a basic camera.
2. Name the essential parts of a basic camera (lens, camera body, film holder, and shutter).
3. Identify four types of cameras (view, viewfinder, single lens reflex, and twin lens reflex).
4. Construct and demonstrate proper techniques in using a pinhole camera (simple).
5. Develop black and white photographs using standard development procedures.

CORE INSTRUCTIONAL ACTIVITIES:
1. Have student identify photographs or drawings of different types of cameras, label the parts of a basic camera, and explain how these parts interact to produce a photographic image (using a teacher-prepared handout).
2. Identify the major parts of a basic camera using a pinhole camera. Describe how the pinhole acts as a lens and how the photographic image is projected onto the light-sensitive material.
3. Construct a pinhole camera.
4. Load the pinhole camera with single or medium weight photographic paper. Make a minimum of two exposures (continue until proper exposure is achieved). Develop the exposures using standard print development techniques.
5. Print positive images from the negatives developed in Activity 4.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Describe the techniques used to produce a timed exposure. Produce a timed exposure using a pinhole camera; develop the negative; make a positive from the negative. Discuss the outcome.
2. Describe the procedures used to produce a multiple exposure using a pinhole camera. Use a pinhole camera to produce the multiple exposure; develop the negative; make a positive from the negative. Discuss the outcome.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

X-Acto Knife
Enlarger
Safelight
Processing Trays (4)
Timer
Print Tongs (4--one per tray)
Scissors
Reusable Film Canisters
Print Washer
Drying Rack
Darkroom Sink

MATERIALS/CORE:

Teacher-Prepared Handouts
Photographic Paper
Processing Chemicals
Oatmeal Box
Electrician's Tape
Aluminum Can
Fine Sandpaper
Small Piece of Poster Board
Sharp Needle
Black Spray Paint

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Photographic Paper
Processing Chemicals

APPLICATIONS OF TERMS:

Camera Body
Lens
Film Holder
Shutter
View
Single Lens Reflex (SLR)
Photosensitive Material
Timed Exposure
Multiple Exposure
Negative Image
Positive Image
Viewfinder
Twin Lens Reflex (TLR)

REFERENCES:

Seymour, Richard D., Exploring Communications, South Holland, IL: Goodheart-Willcox Company, Inc., 1987.

Walker, John R., Graphic Arts Fundamentals, South Holland, IL: Goodheart-Willcox Company, Inc., 1992.

Walker, R. J., and R. E. Walker, Exploring Photography, South Holland, IL: Goodheart-Willcox Co., Inc., 1991.

REFERENCE: 4.2

MAJOR TITLE: Communication Technology

UNIT TITLE: 35mm Single Lens Reflex (SLR) Camera

MAJOR CONCEPT: The 35mm SLR is a commonly used camera, combining versatility with maximum control of the photographic medium.

TOPICS:
1. Parts of the 35mm Camera
2. Loading, Advancing, and Unloading Film
3. Holding and Carrying a Camera
4. Lens Changing, Care, and Accessories
5. Preventive Maintenance and Storage

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Identify the parts of a basic 35mm single lens reflex (SLR) camera.
2. Demonstrate proper procedures of loading, advancing, and unloading film.
3. Demonstrate proper methods of holding and carrying a 35mm camera.
4. Demonstrate proper techniques for changing camera lens.
5. Discuss proper care, maintenance, and storage of cameras and lenses.

CORE INSTRUCTIONAL ACTIVITIES:
1. Label the parts of a 35mm single lens reflex (SLR) camera using a teacher prepared handout.
2. Identify the major parts, and describe the functions of a 35mm single lens reflex (SLR) camera. Demonstrate proper methods of holding the camera (vertical and horizontal) and proper methods of carrying the camera (small groups provided with a 35mm camera).
3. Following a teacher demonstration, practice changing lenses, loading, advancing, and unloading film (small groups provided with a 35mm camera).

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Examine other types of cameras (medium format single lens reflex (SLR), twin lens reflex, view, etc.).
2. Compare advantages and disadvantages of different systems (SLR versus TLR, etc.).
3. Develop a consumer guide (class use) for 35mm single lens reflex (SLR) camera. Research periodicals such as photography specialty magazines, and develop a chart comparing costs and specific features of various models.
4. Write a user guide to the proper care, preventive maintenance, and storage requirements for a 35mm single lens reflex (SLR) camera.

EVALUATION:
Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
35mm Camera(s) With Lens

MATERIALS/CORE:
Teacher-Prepared Handout: Parts of a 35mm Single Lens Reflex (SLR) Camera

TOOLS AND EQUIPMENT/ADVANCED:
Variety of Cameras

MATERIALS/ADVANCED:
Periodicals

APPLICATIONS OF TERMS:

Vertical Format	Film Release Button
Horizontal Format	Shutter Release Button
Camera Body	Film Path
Lens	Film Plane
Lens Mount	Pressure Plate
Index Point	Mirror
Camera Back	Prism
Viewfinder	Rewind Knob (Lever)
Take-Up Sprockets	Shutter

REFERENCES:

Seymour, Richard D., Exploring Communications, South Holland, IL: Goodheart-Willcox Company, Inc., 1987.

Walker, John R., Graphic Arts Fundamentals, South Holland, IL: Goodheart-Willcox Company, Inc., 1992.

Walker, R. J., and R. E. Walker, Exploring Photography, South Holland, IL: Goodheart-Willcox Co., Inc., 1991.

REFERENCE: 4.3

MAJOR TITLE: Communication Technology

UNIT TITLE: Composition

MAJOR CONCEPT: Composition is a process in the art of photography through which the photographer creates, develops, and communicates ideas and feelings.

TOPICS:

1. Subject Placement (rule of thirds)
2. Horizontal and Vertical Formats
3. Camera Angle
4. Additional Factors (foreground, background, depth of field, selective focus, framing, artistic license, etc.)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify five factors (format, subject position, center of interest, foreground elements, background elements, selective focus, camera angle, and depth of field) that contribute to "good" composition.
2. Analyze and critique the composition of selected photographs according to the criteria established in class (factors listed above).
3. Compose one or more photographs which demonstrate the utilization of the basic principles of composition.
4. Compose photographs using vertical and horizontal formats.

CORE INSTRUCTIONAL ACTIVITIES:

1. Analyze and critique the composition of selected photographs (provided by the teacher). Identify and discuss the compositional factors used and omitted. Identify changes in composition that could be made to improve the photograph. If no changes appear to be needed, indicate this and defend your position.
2. Select properly exposed photographs which utilize the basic principles of "good" composition from a contact sheet. Study the frames selected, and crop where necessary to improve the overall composition.
3. Compose a series of photographs utilizing the basic principles of composition. Each photo in the series should emphasize one particular aspect of basic composition. Use both vertical and horizontal formats.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Explore how various focal length lenses (wide angle, medium telephoto, long telephoto, and zoom) affect composition. Report to the class your findings regarding depth of field, camera angle, foreground, background, and selective focus.
2. Use different types of cameras and lenses to explore how camera format affects composition.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
Camera/Normal Lens

MATERIALS/CORE:
Selection of Photographs
Contact Sheets
Film

TOOLS AND EQUIPMENT/ADVANCED:
Variety of Cameras (TLR, SLR-Medium Format, Press, View, or whatever is available)
Several Lenses of Varied Focal Length (35mm)

MATERIALS/ADVANCED:
Film

APPLICATIONS OF TERMS:

Composition	Focal Length
Subject	Format
Background	Vertical Format
Foreground	Horizontal Format
Depth of Field	Telephoto
Selective Focus	Wide Angle

REFERENCES:
Jones, Ronald E., and Janet L. Robb, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich Publishers, 1986.

Seymour, Richard D., Exploring Communications, South Holland, IL: Goodheart-Willcox Company, Inc., 1987.

Walker, R. J., and R. E. Walker, Exploring Photography, South Holland, IL: Goodheart-Willcox Co., Inc., 1991.

REFERENCE: 4.4

MAJOR TITLE: Communication Technology

UNIT TITLE: Exposure

MAJOR CONCEPT: Exposure is the process that controls the amount of light striking the photosensitive material.

TOPICS:

1. Definition of Exposure
2. Aperture
3. Shutter Speed
4. Metering System
5. Depth of Field
6. ASA/ISO (Film Speed)
7. Determining Proper Exposure Using a Meter
8. Estimating Proper Exposure

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Define aperture, shutter, shutter speed, depth of field, F-stop, meter, bracket, and exposure.
2. Expose film using the internal metering system of the camera properly.
3. Expose film in an available light situation using estimation properly.
4. Control for desired depth of field by adjusting aperture and shutter speed.

CORE INSTRUCTIONAL ACTIVITIES:

1. Develop a computer generated crossword puzzle incorporating the following terms using a computer and a crossword puzzle program.

Aperture	F-Stop
Shutter	Meter
Shutter Speed	Exposure
Depth of Field	Bracket

2. Photograph a variety of objects under different lighting conditions using a 35mm SLR with a built-in exposure meter (LED or CDS). (Use a moderately high speed film such as ASA 400 to provide as much flexibility as possible.)
3. Make a minimum of two correct exposures using different apertures and shutter speeds using the built-in exposure meter. Record exposure information for each exposure. (The same shutter speed or aperture should not be used more than once, if possible). Record the distance from the object as indicated on the depth of field scale on the lens. Also record the focal length of the lens for future reference.
4. Estimate correct exposure by setting the shutter speed of the camera to the speed closest to the speed of the film being used (400 ASA Film - Shutter Speed = 1/500). Use an atmospheric condition scale to determine the aperture:

<u>ASA 400 FILM</u>

Bright Sun ------------------- f16 - f11
Bright Hazy ------------------ f11 - f8
Slightly Overcast ----------- f8 - f5.6

Cloudy (Heavy) ------------- f5.6 - f4
Deep Shadows -------------- f4 - f2.8

(The same scale can be generalized to other film speeds by adjusting the shutter speeds accordingly. Be sure to bracket exposures to ensure quality.)

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Experiment with timed exposures using a slow speed film and a small aperture (f16-f22). (The camera needs to be supported by a tripod or other device. The shutter speed should be set on B (bulb) so that the shutter remains open for the desired period of time. This activity can be done at night for dramatic results. Note: This is an inexact process which may require considerable experimentation.)
2. Experiment with multiple exposure. (This may easily be accomplished by either one of two methods. One method requires shooting two or more shots, underexposing each shot so that the combined exposures equal the proper exposure of the film. The other method requires masking a portion of the lens so that only a portion of the film is exposed during any one exposure.)

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Computer
Printer
35mm Single Lens Reflex (SLR)

MATERIALS/CORE:

Crossword Puzzle Program
Film (400 ASA)

TOOLS AND EQUIPMENT/ADVANCED:

35mm Single Lens Reflex (SLR)
Tripod

MATERIALS/ADVANCED:

Film (400 ASA)

APPLICATIONS OF TERMS:

Aperture
Meter
F-Stop
Depth of Field
Multiple Exposure
Shutter Speed
Shutter
Bracket
Exposure

REFERENCES:

Seymour, Richard D., Exploring Communications, South Holland, IL: Goodheart-Willcox Co., Inc., 1987.

Walker, John R., Graphic Arts Fundamentals, South Holland, IL: Goodheart-Willcox Co., Inc., 1992.

Walker, R. J., and R. E. Walker, Exploring Photography, South Holland, IL: Goodheart-Willcox Co., Inc., 1991.

REFERENCE: 4.5

MAJOR TITLE: Communication Technology

UNIT TITLE: Properties of Film and Film Development

MAJOR CONCEPT: An understanding of the properties of films and film development processes is essential to the creation of quality photographic images.

TOPICS:
1. Types of Film
2. Film Speed
3. Film Developing Equipment and Materials
4. Black and White Film Processing

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Identify a minimum of three (3) types of photographic film.
2. Identify the basic equipment used in black and white film processing.
3. Explain the significance of ASA/ISO ratings.
4. Demonstrate proper procedures for developing black and white film.

CORE INSTRUCTIONAL ACTIVITIES:
1. Identify, using empty film canisters or film boxes, the types of film represented, indicate their suggested speed (ASA/ISO rating), and identify standard uses for each film.
2. Analyze finished photographic products to determine what type of film was used. These materials may be provided by the instructor.
3. Identify the necessary equipment and photographic supplies (chemicals) needed to develop black and white film. Set up the equipment in the darkroom according to standard photographic procedures. Mix and prepare all chemicals according to the directions provided with the chemicals.
4. Develop film utilizing standard development procedures using black and white film previously exposed. After drying, inspect the film for proper exposure and development. Using a film loop (magnifier), examine the developed film for defects due to improper or inadequate development procedures.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Develop additional rolls of exposed film (B&W) of different speeds (T-MAX 100, T-MAX-400, etc.).
2. Experiment with different developers (B&W) to determine their individual properties and characteristics. Develop a chart indicating specific characteristics of the different developers (contrast, tone graduation, grain, etc.).
3. Expose and develop a roll of chromogenic film (XP1 or Vario-XL). Report your findings regarding the exposure capabilities and the development procedures when using these relatively new films.
4. Push a roll of ASA 400 one or two stops using Acufine or a similar developer.

5. Pull a roll of ASA 400 one stop by using Microdol or a similar developer. Experiment with time reduction using a standard developer.
6. Develop a roll of color reversal film (Ectachrome) using the E-6 process.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Developing Tank & Reels	Reusable Film Canisters
Thermometer	Scissors
Timer	Film Clips
Measuring Graduates	Hose (for rinsing)
Funnel	Negative Files
Stirring Rod	Sponge (optional)
Chemical Storage Containers	Changing Bag (optional)
Film Loop	Safe Light

MATERIALS/CORE:

Film Developer (D-76 or equivalent)
Exposed Film
Fixer (Kodafix or Rapid Fix)
Running Water (rinse)
Stop Bath
Wetting Agent
Empty Film Cassettes or Boxes
Finished Photographic Materials

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Core Materials Plus:
Variety of Different Speed B&W Films (T-MAX 100, T-MAX 400, etc.)
Variety of Developers (HC-110, Microdol, Ilford ID-11, Edwal FG-7, Acufine, Agfa Rodinal, etc.)
Ectachrome Film
E-6 Chemistry
XP1 and Chemistry

APPLICATIONS OF TERMS:

Develop	Fogged	Density
Stop Bath	Cassette	Chromogenic
Fix (Hypo)	Changing Bag	Highlight
Film Speed	Wetting Agent	Shadow Detail
Reversal	Grain	Exposure Latitude
Overdevelop	Agitation	Underdeveloped
Air Bell	Uneven Development	Contrast

REFERENCES:

Seymour, Richard D., Exploring Communications, South Holland, IL: Goodheart-Willcox Company, Inc., 1987.

Walker, John R., Graphic Arts Fundamentals, South Holland, IL: Goodheart-Willcox Company, Inc., 1986.

Walker, R. J., and R. E. Walker, Exploring Photography, South Holland, IL: Goodheart-Willcox Co., Inc., 1991.

REFERENCE: 4.6

MAJOR TITLE: Communication Technology

UNIT TITLE: Contact Printing and Enlarging

MAJOR CONCEPT: Print development involves the use of light and chemical processes to transfer an image onto a light sensitive material.

TOPICS:
1. Photographic Papers
2. Contact Printing
3. Making a Test Strip
4. Printing and Enlargement
5. Special Techniques

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Identify properties of different photographic papers (bases, surface texture, tone, contrast weight, etc.).
2. Expose a test strip properly.
3. Expose a contact sheet properly.
4. Enlarge a minimum of two prints using proper procedures and techniques.

CORE INSTRUCTIONAL ACTIVITIES:
1. Inspect a selection of photographic papers (supplied by the teacher). Determine weight, texture, and base. Evaluate contrast, image tone, paper tint, etc. Discuss the different papers, their characteristics, and their uses.
2. Contact print negatives which were developed in a previous activity on an 8" X 10" sheet of photographic paper. Evaluate the contact sheet and reprint if necessary. Analyze and evaluate each frame on the contact sheet. Use exposure and composition as the primary criteria for evaluation. Select a minimum of two frames to be enlarged.
3. Enlarge one of the two frames selected in the previous activity to a 3 1/2" x 5" format. Crop and experiment with various compositions before actual printing. Once the composition has been finalized, print a test strip to determine proper exposure. Alternate exposures on the test strip should be in 5-second intervals. Evaluate the test strip to determine the proper exposure time and filtration requirements as needed. Repeat the above procedure for the second frame selected, but enlarge to a 5" X 7" print.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Research information pertaining to advanced enlarging techniques. Practice burning in and dodging techniques. Make an enlargement (8" X 10") using burning in and dodging techniques studied.
2. Develop texture screens for special effects. (This may be done by photographing very simple objects with strong line definition, e. g., screen, crushed ice, sand, etc.) Use these screens to sandwich with standard negatives for special printing effects. Print one special effect using the screen.

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EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Enlarger Lens	Tongs
Contact Printer	Print Washer
Easel	Print Dryer or Drying Rack
Contrast Filters	Camel-Hair Brush
Focusing Aid	Canned Air
Timer	Storage Containers of Chemicals
Safelight	Paper Cutter
Trays (4)	

MATERIALS/CORE:

Exposed Negatives
Developer
Stop Bath
Fix
Photographic Paper
Selection of Sample Papers
Running Water (Wash)
Hypo-Check

TOOLS AND EQUIPMENT/ADVANCED:

Same
Burning and Dodging Tools
Camera

MATERIALS/ADVANCED:

Film

APPLICATIONS OF TERMS:

Enlargement	Resin Coated	Contrast
Enlarger	Fiber Base	Paper Grade
Negative Carrier	Vignetting	Multigrade
Crop	Paper Weight	Matte
Burn-In	Safelight	Glossy
Dodge	Paper Safe	

REFERENCES:

Walker, R. J., and R. E. Walker, Exploring Photography, South Holland, IL: Goodheart-Willcox Co., Inc., 1991.

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REFERENCE: 4.7

MAJOR TITLE: Communication Technology

UNIT TITLE: Applications of Advanced Photographic Technology

MAJOR CONCEPT: Applications of advanced technology are constantly being integrated into the photographic processes.

TOPICS:

1. Automatic Metering Systems
2. Auto Exposure/Auto Focus Cameras
3. Dedicated Flash
4. Fiber Optics
5. Computerized Print Processing
6. Digital Image Processing
7. Digital Coded Film
8. Holography (Laser)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify five specific applications of advanced photographic technology (dedicated flash, auto exposure/auto focus cameras, digital coded film, digital image processing, and holography) in the photographic industry.
2. Describe how an automatic metering system in a camera operates.
3. Describe how a dedicated flash unit operates.
4. Illustrate and discuss the basic concept of digital image processing.

CORE INSTRUCTIONAL ACTIVITIES:

1. Research current photography periodicals for applications of advanced technology in photography. Select a minimum of five applications (listed above in Objective 1), record your findings, and make a brief report to the class.
2. Construct a scrapbook of photographs, articles, advertisements, and other clippings which pertain to applications of advanced technology in photography.
3. Design and present a bulletin board on "Advanced Technology in Photography." (Class Project)
4. Expose a roll of film using an automatic computerized SLR. Expose frames in all modes (manual, aperture preferred, shutter preferred, fully automatic, and automatic flash modes). Expose the film under all lighting conditions. Be sure to include backlit situations, heavy shadows, light (reflective) subject matter, and compositions with high contrast. Process and contact the film.
5. Examine the contact sheet and analyze exposures. Describe the interaction of the exposure meter with the camera in the various available light modes. Describe how the dedicated flash works during the automatic flash mode. Describe any weaknesses of the system that you observe, and indicate how these can be overcome.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Use a computer and a graphic printing program to simulate digital image processing. Discuss the digital image process. Describe how the information (pixels and dots produced on the dot matrix printer) is encoded, stored, edited, and processed.
2. Use a computer assisted drafting station (CAD) to simulate digital image processing. Complete a basic drawing by locating individual points using Cartesian coordinates. Describe how this method of drawing relates to digital image processing.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Scissors
Film Processing Equipment (see 3.1.6)
Darkroom Equipment (see 3.1.7)
Automatic SLR Camera With Lens
Dedicated Flash Unit
Stapler

MATERIALS/CORE:

Periodicals
Film
Film Processing Materials (see 3.1.6)
Print Processing Materials (see 3.1.7)
Bulletin Board Paper
Staples
Stencils (letters)

TOOLS AND EQUIPMENT/ADVANCED:

Computer Aided Drafting (CAD) System

MATERIALS/ADVANCED:

PRINT SHOP software

APPLICATIONS OF TERMS:

Automatic Metering Systems
Digital
Digital Coded Film
Digital Image Processing
Computerized Print Processing
Dedicated Flash
Auto-Focusing
Fiber Optics
Dot Matrix
Cartesian Coordinates
Hologram
Holography
Laser
Mode
Aperture Preferred
Shutter Preferred
Backlit
Pixels
Encode

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REFERENCES:

Jones, Ronald E., and Janet L. Robb, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich, 1986.

Walker, R. J., and R. E. Walker, Exploring Photography, South Holland, IL: Goodheart-Willcox Co., Inc., 1991.

REFERENCE: 5.0

MAJOR TITLE: Communication Technology

UNIT TITLE: Introduction to Electronic Communication

MAJOR CONCEPT: Electronic communication is essential in today's society.

TOPICS:
1. History
2. Impact on Society
3. Key Elements of a System
4. Characteristics/Limitations

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Analyze the major changes that electronic communication has had on society in the last 40 years.
2. Build a display of an electronic communication system, or chart the evolution of an electronic communication system.
3. Define and discuss the given terms associated with the key elements of a communication system.

CORE INSTRUCTIONAL ACTIVITIES:
1. Build a display of an electronic communication system.
2. Conduct an informal interview. Contact elderly people to better understand the impact that TV (or the computer) has had on the world as seen through their eyes.
3. Compile an electronic communication notebook depicting various applications of electronic communication systems. (Keep the notebook up-to-date throughout the course with newspaper articles, etc.).
4. Make a poster/bulletin board display charting the evolution of electronic communication or a specific electronic communication system.
5. Identify and/or describe the following key elements of an electronic communication system:

sender	transmit	encode	noise
channel	receive	receiver	decode
feedback	input	process	output

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Discuss how lives today would be different if we did not have electronic communication.
2. Evaluate which of various communication techniques have grown or lost importance in the past forty years. This may be done through a questionnaire using the following sample forms of communication:
   1. Personal letters
   2. Long-distance telephone calls
   3. Radio listening
   4. Television viewing
   5. Reading of printed material (i.e., books, newspapers, and magazines)

EVALUATION:
Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
Overhead projector
Chalkboard

MATERIALS/CORE:
Teacher-Made Transparencies
Poster Paper

TOOLS AND EQUIPMENT/ADVANCED:
Same

MATERIALS/ADVANCED:
Examples of Bar or Pie Chart

APPLICATIONS OF TERMS:

Sender	Receiver	Encoder
Decoder	Feedback	Transmit
Noise	Encode	Channel
Receive	Bar/Pie Graph	Input
Process	Output	Electronic

REFERENCES:
Johnson, C. D., Communication Systems, South Holland, IL: Goodheart-Willcox Co., Inc., 1992.

Jones, Ronald E., and Janet L. Robb, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich, 1986.

REFERENCE: 5.1

MAJOR TITLE: Communication Technology

UNIT TITLE: One-Way Telecommunication Systems

MAJOR CONCEPT: One-way telecommunication is the use of radio and TV signals to convey information to the public.

TOPICS:
1. Radio
2. Television
3. Sound, Transmission, and Reception
4. Programming Elements

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Identify and explain the function of a TV receiver/transmitter, including its subsystems, according to teacher-approved guidelines.
2. Differentiate between AM and FM.
3. Identify, list, and describe the various radio programming elements (i.e., music and news).
4. Develop a programming clock for an identified broadcasting time segment, and evaluate the information contained in it (pie chart).
5. Identify five careers in the radio/TV broadcasting industry.
6. Describe technical characteristics of radio wave transmission that affect programming decisions.

CORE INSTRUCTIONAL ACTIVITIES:
1. Describe the basic differences between AM and FM, and discuss the advantages and disadvantages of each.
2. Construct a block diagram of a transmitter and receiver.
3. Analyze a 10-minute segment from teacher-made programming clock, and record the programming elements using the coding developed in class.
4. Identify a code system (symbols and colors) for all the identified programming elements (music, news, conversation, commercials, talk nets, and weather reports).
5. Identify the clearest AM stations in the area, and discuss the conditions that can affect reception (i.e., power lines, inside, and weather conditions).
6. Build a crystal radio receiver.
7. Trace the path of sound waves from the transmission of sound at a transmission/broadcasting station to the reception of the sound waves by the receiver, and identify how these sound waves are transmitted through the use of the transmitter/receiver subsystems.
8. Experiment with radio reception by inserting various kinds of materials between the radio and the broadcasting station. Record the results and discuss the effects (wood, solid metal, glass, plastic, tinsel, fabric, etc.).
9. Experiment with various radio/sound transmission circuits, and transmit information using the circuit. (Radio Shack manufactures a 160 or 201 Projects In One Kit; it satisfies the equipment need of this activity.)

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Construct a radio from given components using a schematic diagram.
2. Arrange an investigative report on asbestos in a school building.
3. Produce a one-way communication system (audio or video), record the responses of those receiving the information, and identify whether or not the message was clearly communicated.
4. Define frequency and bandwidth.
5. Discuss any technical reasons behind programming differences between radio bands AM and FM. (AM--news, sports, and broadcasts . . . ; FM--high-quality, stereo . . .)

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Video Camera
Monitor/TV
VCR/VTR
Tape Recorder With Mixer and Microphone(s)
Communication Module Including Radio and TV Assembly Kits/Circuits
Radio Shack's 160 or 201 Projects In One Kit
Stopwatch

MATERIALS/CORE:

Chalkboard
Overhead
Videotape and Cassette Tape
Poster Board
Cardboard
Colored Markers

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Same

APPLICATIONS OF TERMS:

Wave
Mix Down
Tuner
Audio Signal
Lacquer
Speaker
Transmitter Antenna
Tape Recorder
Track
Sky Waves
Cellular Telephone System
Amplitude Modulation
Videocassette Recorder (VCR)
Scanning
Microchip
Closed Circuit TV
Crystal Radio
Transistor
Integrated Circuit
Antenna
Radio Wave
Master Tape
Amplifier
Transmitter
Stamper
Recording Industry
Ground Waves
Record Player
Mixing Board
Vidicon Tube
Satellite Dish
Cable Vision
Cathode Ray Tube
Videodisk
Frequency Modulation
Transistor Radio

REFERENCES:

Johnson, C. D., Communication Systems, South Holland, IL: Goodheart-Willcox Co., Inc., 1992.

Jones, Ronald E., and Janet L. Robb, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich, 1986.

REFERENCE: 5.2

MAJOR TITLE: Communication Technology

UNIT TITLE: Two-Way Telecommunication Systems

MAJOR CONCEPT: Two-way telecommunication is the ability to transmit and receive information.

TOPICS:

1. Telephone
2. Telegraph
3. Teletype
4. Two-Way Radio
5. Cellular Telephone
6. Careers

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Explain the basic elements of a two-way communication system (input, process, output, and [feedback]).
2. Identify and explain the use of the basic components of a telephone, telegraph, Teletype, and two-way radio.
3. Construct and demonstrate the use of a basic two-way communication system (telephone, telegraph, Teletype, or two-way radio).
4. Differentiate between a regular telephone and a mobile telephone (cellular telephone) or between a wired and wireless two-way communication system.
5. Simulate Teletype operations with a computer, printer, and modem.
6. Categorize a given list of two-way telecommunication careers and/or two-way radio careers under the titles: telephone, telegraph, and Teletype. Identify which of these careers have "carryover capabilities," e.g., an electrical repairperson. Could s/he be placed under more than one category?
7. Construct a basic telegraph machine, and communicate a message.

CORE INSTRUCTIONAL ACTIVITIES:

1. Identify the elements of input, process, and output (and feedback) in a given two-way communication system.
2. Role play the proper procedures to call for information or to call in an emergency on a CB radio.
3. Identify and explain the use of the basic components of a given telephone, telegraph, Teletype, and two-way radio.
4. Construct, using a bag of miscellaneous items, a two-way communication system which will transmit a message over a 30-foot distance.
5. Obtain information, through a modem and the use of a computer and printer, from the ITEA computer network or some other network to simulate Teletype.
6. Categorize a given list of two-way communication careers by pasting or writing them in a notebook under the following topics: telephone, telegraph, Teletype, and two-way radio.

7. Use sheets of metal, soda cans, paper clips, wire, wood, nails, lamps, bells, batteries, other assorted items, or a breadboard and assorted electronic components to create a functional telegraph. Transmit and receive at least five lines of information. (A coding system might have to be worked out.)
8. Use the SOUTH CAROLINA OCCUPATIONAL INFORMATION SYSTEM (S.C.O.I.S.) to simulate communication by Teletype and obtain career information.
9. Determine the most cost-effective time for phone calls. Gather information from a local telephone company on the cost of long distance phone calls made at different time periods during the day/week (morning, afternoon, evening, night, weekdays, weekends, holidays, etc.). Show evidence of the research on a diagram/chart.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Send a message using Morse code on a student-made telegraph.
2. Identify terms used when talking on a CB radio.
3. Demonstrate the proper use of a CB radio.
4. Design, construct, and use a two-way communication system (using an electronic communication module).
5. Identify laws and regulations dealing with two-way communication systems.
6. Invite a licensed radio amateur to the class to tell about this form of communication technology.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Computer
Printer
Modem
General Lab Hand Tools
Telephone
CB or Amateur Radio

MATERIALS/CORE:

Printing Paper
Computer Software
Assorted Electronic Parts Including Wire, Buzzers, Bells, Paper Clips, and Screws
Resource Books on CB and Amateur Radio Operation
Prepared List of Careers

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Same

APPLICATIONS OF TERMS:

- Mouthpiece
- Connecting Mechanism
- Receiver
- Waves
- Electromagnetic Energy
- Electromechanical Field
- Tuner
- Speaker
- Carbon Granules
- Coils
- Computer
- Electromagnet
- Earpiece
- Transmitter
- Cellular Telephone
- Audio Signal
- Transmitting Antenna
- Antenna
- Amplifier
- Switching Office
- Diaphragm
- Modem
- Printer

REFERENCES:

Johnson, C. D., Communication Systems, South Holland, IL: Goodheart-Willcox Co., Inc., 1992.

Jones, Ronald E., and Janet L. Robb, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich, 1986.

REFERENCE: 5.3

MAJOR TITLE: Communication Technology

UNIT TITLE: Fiber Optics Communication

MAJOR CONCEPT: Fiber optics is a method of transferring light signals through optical fiber(s).

TOPICS:
1. Light Sources
2. Processes
3. Products
4. Optical Materials

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Explain the principle of a fiber optics communication system.
2. Discuss the advantages/disadvantages of a fiber optic communication system.
3. Identify at least two light sources that can be used in fiber optics.
4. Arrange the following processes in proper order, and explain the function of each: a) Designing, b) Transmitting, c) Decoding, d) Encoding, and e) Receiving.
5. Select one of the following product areas, and research how fiber optics is being used in the area: a) Entertainment, b) Information/Data, and c) Detection.
6. Make and use a fiber optics communication system.

CORE INSTRUCTIONAL ACTIVITIES:
1. Identify at least five forms of light (sun, campfire, torch, candle, oil lamp, lantern, incandescent lamp, neon lamp, semiconductor lamp, radioactive substances, or LASER). Use a light meter to analyze various light transmitting qualities of these materials: fiber optic fibers, polished Plexiglas, glass tubes, etc. These should be used in conjunction with the above light forms to determine the best combination. Document various results.
2. Identify methods that are used in processing information in a fiber optics communication system (i.e., light conversion, efficiency, maintenance, safety, lifetime, and portability).
3. Discuss and perform experiments to show why the following are advantages of using a fiber optic system:
   - 3.1 Withstanding more abuse than a copper wire of equal size
   - 3.2 Less weight than copper wires
   - 3.3 Size advantage
   - 3.4 Able to withstand all kinds of weather
   - 3.5 Immune to most erosive and corrosive elements
   - 3.6 Can carry high volume of different signals
4. Develop a communication system with the apparatus in Activity 1.
5. Draw a poster/diagram of a fiber optic system.
6. Diagram the way that fiber optics can be used in entertainment, information/data, and/or detection.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Identify the encoding, transmitting, decoding, and receiving elements of a fiber optic system.
2. Experiment and create a usable fiber optic system using an experimenter board, an emitter/detector and fiber cable package (e.g., Radio Shack's), and other necessary components and materials.
3. Discuss how light is transmitted through the fiber optic cable, even when bent, looped, or "tied in a loose knot."
4. Research a particular area dealing with fiber optics or with materials/components used in a fiber optic system.
5. Use a strip heater to bend (Plexiglas) acrylic to various shapes and sizes. Transmit light through the polished edges after taping or covering all other surfaces, and record the experimental data. (Record which shapes caused the most problems in transmitting.)
6. Graph or record the differences in using a laser as opposed to an LED transmitted light source. (Use a multimeter/oscilloscope to observe the effects in the circuit.)
7. Use the computer to analyze and document the experimental data from experiments dealing with fiber optics.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

LASER
General Lab Tools
Fiber Optics Module/Kit
Computer System
Multimeter (used to measure volts, ohms, and amps)
Oscilloscope

MATERIALS/CORE:

Electronics Experimenter Kit (e.g., Radio Shack's 201 or 160 Projects In One Kit)
Assorted electronic components (including LED's, transistors, speakers, diodes, resistors, transformers, fiber optic cable, emitter/detector, and wire)
Flashlight
Acrylic (various sizes)
Candies
Incandescent Lamp
Neon Lamp
Software Dealing With Fiber Optics
1" Diameter Clear Acrylic Plastic

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Same

APPLICATIONS OF TERMS:

Fiber	Optic	Fiber Optic
Emitter	Detector	Transducer
Incandescent	Neon	LED
Transmitter	Receiver	Encoding
Decoding	Resistor	Diode
Transformer	Transistor	Semiconductor
Circuit Board	LASER	Acrylic
Immune	Radioactive	Portability
Maintenance	Efficiency	Conversion

REFERENCES:

Johnson, C. D., Communication Systems, South Holland, IL: Goodheart-Willcox Co., Inc., 1992.

Tischler, Morris, Optoelectronics: A Text-Lab Manual, McGraw-Hill Book Company, 1986.

Understanding Optronics, developed and published by Texas Instruments Learning Center, P.O. Box 225012 MS-54, Dallas, TX 75265.

REFERENCE: 5.4

MAJOR TITLE: Communication Technology

UNIT TITLE: Satellites in Communication

MAJOR CONCEPT: A communication satellite is a man-made object orbiting in space.

TOPICS:
1. Classification of Communication Satellites
2. Purpose
3. Transmission/Reception

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Classify satellites by type, and explain how they are used in communication (weather, communication, navigation, scientific, military, mapping, and environmental monitoring).
2. Construct a model of a communication satellite.
3. Simulate transmitting and receiving images from communication satellites.

CORE INSTRUCTIONAL ACTIVITIES:
1. Classify different types of communication satellites (from pictures or diagrams/drawings), and explain the major differences and uses of each. Examples: weather, communication, navigation, scientific, or military.
2. Use styrofoam/paper mache or some other material to construct a satellite. Connect this to a globe to show (geosynchronous) orbit.
3. Simulate transmitting and receiving images from a communications satellite. One student shall be the transmitter (satellite) and the rest of the class shall be the receiver (dish). The "transmitter" uses an overhead projector, clear acetate (with a graph drawn on it), and a picture to slide under the acetate. The "receivers" will have a paper graph the same size as the "transmitter." The "transmitter" will "read" each square or "pixel" on the graph (what the camera lens "sees") and transmit this information to the receivers, whether the square is white, dull white, light gray, medium gray, dark gray, or black. The transmitter continues throughout the whole picture until all the pixels have been transmitted and the receivers have drawn an exact replica.
4. Research, discuss, and/or simulate how communication satellites send radio messages, telephone calls, and television programs between distant parts of Earth, help pilots and sailors find their exact positions in all kinds of weather, measure the Earth's magnetic field, explore space galaxies measuring rays that never reach Earth, warn or guard against surprise missile attacks, or forecast and study weather.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Use a satellite dish to receive information on weather conditions or to receive images on a TV/monitor.
2. Diagram geosynchronous orbit on poster board, and explain the principle of it.

ADVANCED INSTRUCTIONAL ACTIVITIES continued

3. Write to *NASA for satellite information, and share the information with the class, or request information on a particular satellite to use in a research report.
   *For South Carolina: Teacher Resource Center
   NASA Langley Research Center
   Mail Stop 146
   Hampton, VA 23665-5225
   (804) 864-3297
4. Embed a receiver/transmitter in a globe, suspended from a continuous loop clothesline, and simulate its movement/effect by sending and receiving signals to stations in the classroom.
5. Mount a flashlight on a "lazy Susan," and spin the flashlight to simulate the transmission/relay of radio signals/information using a passive satellite. (NOTE: To perform the actual simulation, a 3" by 3" pocket mirror is used to represent a passive satellite. The process involves the rotation of the "earth station," and as it rotates past the "satellite" mirror, it will reflect the light beam back to the "earth receiving station." When the light beam strikes the phototransistor, it will signal the receipt of a "message" (by sounding a buzzer). *Refer to reference list: The Technology Teacher, Nov. 1985.
6. Visit a local vendor of satellite dishes, and share the information and experiences with the class.
7. Explain how the Space Shuttle is used to maintain satellites in space.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Overhead Projector/Screen
General Lab Tools
Plywood
Pocket Mirror
Flashlight
"Lazy Susan"

MATERIALS/CORE:

Paper Mache Material
Globe
Transparency
Styrofoam
Poster Board
Graph Paper
Electronic Components to Make Transmitter/Receiver Device

TOOLS AND EQUIPMENT/ADVANCED:

Same (plus a satellite dish and a computer system)

MATERIALS/ADVANCED:

Same

APPLICATIONS OF TERMS:

Satellite	Satellite Dish
Orbit	Moon
Navigation	Artificial
Echo Balloons	Decay
Reconnaissance	Orbiting Observatories
Magnetometer	Solar
Geophysical	Astronomical

REFERENCES:

Johnson, C. D., Communication Systems, South Holland, IL: Goodheart-Willcox Co., Inc., 1992.

National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22151.

Ritz, John M., et al., "Satellite Communication," The Technology Teacher, November 1985, International Technology Education Association, 1914 Association Drive, Reston, VA 22091. (Tidewater Technology Associates (T^2A), an educational consulting group--7045 Doummar Dr., Norfolk, VA 23518.

Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

U.S. Department of Commerce, National Technical Information Service, Springfield, VA 22161.

REFERENCE: 5.5

MAJOR TITLE: Communication Technology

UNIT TITLE: Lasers in Communication

MAJOR CONCEPT: The study of laser technology is the study of light amplification by stimulated emission of radiation.

TOPICS:
1. Laser Modulation
2. Effects of Distance on Laser Light
3. Effects of Noise on Laser Light
4. Effects of Temperature on Laser Light
5. Holography

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Explain how laser light is created.
2. Describe how laser light is used to transmit information.
3. List the components needed for laser transmission of information.
4. Describe and demonstrate the effects of distance, noise, and temperature on a laser beam.
5. Discuss at least five uses of holograms, and propose at least two future uses of holograms (e.g., entertainment, medical--such as projecting the information received from ultrasound to avoid exploratory surgery, photography, motion picture production, and identification).
6. Create a hologram, and explain the basic concepts of how a hologram is made.
7. Describe and demonstrate the functions of the three main parts of a laser (power source or excitation mechanism, active medium, and feedback mechanism).

CORE INSTRUCTIONAL ACTIVITIES:
1. Measure the maximum distances that the laser and receiver can be apart.
2. Design activities in groups, and experiment with changing the direction of a laser beam, laser beam divergence, scattering, beam visibility in air, splitting a laser beam, diffraction, knife edge, and using proper safety precautions. (Never look directly into the beam.)
3. Record the results of misaligning the laser beam from the receiver.
4. Record the quality of sound coming from the speaker as the following noise elements are inserted into the path of the laser:
   - 4.1 sheet of translucent paper
   - 4.2 chalk dust
   - 4.3 atomized water
   - 4.4 glass
   - 4.5 colored filters
5. Discuss the reasons for using mirrors in laser technology.
6. Explain the law of reflection.
7. Identify the necessary components for transmitting information with a laser.
8. Create a hologram using Kodak's package on laser technology.

9. Identify and explain the concepts used in the making of a hologram.
10. Chart at least five past/present applications of holograms and at least two future applications.
11. Project light from a flashlight and a laser into a prism, and compare the difference between the many colors that form when both types of light combine.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Hook up a dual channel oscilloscope to the voice input of the laser and the other channel to the voice output of the receiver, and measure the effects of the change in distance and noise on the laser beam.
2. Explain how to overcome weather problems when using a laser.
3. Explain the reasons for using a front surface mirror versus a back surface mirror.
4. Identify applications of laser in industry.
5. Measure the size of a laser beam when projected to a piece of white poster board.
6. Shine the laser at the substage mirror, and remove the eyepiece of a microscope to use it as a microprojector. A screen placed at the focal plane of the objective lens will produce an enlarged image of the specimen on the stage so it can be viewed by several people simultaneously.
7. Describe the difference in the laser light used in communication systems and the laser light used for welding, drilling, measuring, cutting, and heat treating in industry.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

LASER Kit/Package Including Laser, Mirrors, Microphone Accessories, Detector, and Amplifier
Flashlight
Microscope
Oscilloscope

MATERIALS/CORE:

Acrylic Sheets of Various Thicknesses
Chalk (dust), Water and Spray/Mist Bottle, and Poster Board
Flashlight
Projection Screen
Glass and Filters
Translucent Paper
Holograph Film Developing Kit

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Same

APPLICATIONS OF TERMS:

LASER	Microphone
Variable Distance	Photo-Optic Detector
Receiver	Amplifier

REFERENCES:

Balistreri, Jerry P., "LASER TECHNOLOGY: Introducing Students to Laser Technology for Under $350," The Technology Teacher, Reston, VA: ITEA, Sept./Oct. 1985, page 23.

Boaraiko, Allen A., "A Splendid Light, LASERS," National Geographic, Vol. 165, No. 3, March 1984 pages 335-337.

Brodhead-Garrett Co., 4560 East 71st Street, Cleveland, OH 44105.

Caulfield, H. J. (March 1984). "The Wonder of Holography." National Geographic, pages 364-377.

Eastman Kodak Company, Department 841, 343 State Street, Rochester, NY 14650. (Ask for the educational catalog. You may order @ 10 pamphlets/booklets a month for only the cost of the postage. This is a worthwhile resource.)

Edelson, Edward, "The Bizarre New World of Holography," Popular Science, page 87.

Edmund Scientific, 101 E. Gloucester Pike, Barrington, NJ 08807, 609/547-3488.

Metrologic Instruments, P.O. Box 307, Ballmawr, N.J. 08031.

PITSCO, P.O. Box 1328, Pittsburg, KS 66762.

Schlegel, R. D. (1985). "Reflection Laser Holography." Unpublished manuscript, Millersville University, Department of Industry and Technology.

Schlegel, Ronald D., "LASER HOLOGRAPHY High Tech With High Potential for Learning Activities," The Technology Teacher, Reston, VA: ITEA, May/June 1986, page 23.

Thomas Edison Foundation, 21,000 W. Ten Mile Rd., Southfield, MI 48075, 313/354-3003.

Unterseher, F., J. Hansen, and B. Schlesinger, (1982). Holography Handbook, Berkeley, CA: Ross Books.

REFERENCE: 5.6

MAJOR TITLE: Communication Technology

UNIT TITLE: Microwave Communication

MAJOR CONCEPT: Microwave communication is the use of Super High Frequency (SHF) radio waves to transmit pictures and printed matter at great speed.

TOPICS:

1. Wave Length (1 mm. to 30 cm.)
2. Characteristics of Microwave
   - 2.1 Similarity to light
   - 2.2 Advantages over light
3. Radar (Radio Detection and Ranging)
4. Satellite Communication

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Demonstrate a wave form.
2. Compare AM and FM radio frequency wave length to microwave.
3. Demonstrate the characteristics of microwave with visible light waves. (see Core Activity #3)
4. Identify applications of microwave in communication, e.g., point to point relay (teletext, videotext, TV, or telephone), satellite link (TV, telephone, weather, military, or business), and radar (police, aircraft, weather, or military).
5. Explain how radar detects objects and determines range.
6. Identify the components needed for a microwave communication link with a satellite (ground transmitter [uplink], geosynchronous orbiting satellite, and ground receiver [downlink]).

CORE INSTRUCTIONAL ACTIVITIES:

1. Fasten one end of a five-meter rope to a stationary object at waist level. Hold the other end of the rope so that the rope is off the floor but not taut, and demonstrate wave forms.
2. Choose your favorite AM or FM radio station. Use the formula: Wavelength = 300/Radio Frequency in MHz to compute the wavelength of the carrier wave signal transmitted.
3. Use a light source to demonstrate characteristics of microwave. Microwaves travel at the speed of light. Simulate how microwaves travel at 300 million meters/second using a light in a darkened room. Microwaves travel in a straight line. (In a darkened room, hold a ball in front of a light source, and observe that only one side of the ball is illuminated.) Microwaves can be reflected. (Use a mirror to demonstrate reflection.) They might be concentrated. (Use a magnifying glass to show how light rays collect and concentrate to a point.)
4. Use a rubber ball to demonstrate the principles radar uses to detect objects and determine range. First, throw the ball with nothing in the way -- the ball will not return. Next, throw the ball at an object--the ball will return. Ranging is accomplished by determining the time the ball takes to go out and back. Demonstrate by throwing the ball at the same speed at objects that are at different ranges. Calculate the time it takes the ball to travel out and back for each example. This will indicate range.

5. Use a passing automobile with its horn blowing to illustrate the Doppler effect or frequency shift.
6. Explain how a television signal is transmitted from the studio to a home satellite dish.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Demonstrate wave forms and how a reflector at the correct distance from the source intensifies and concentrates the wave by using a pan of water, a float, string, a weight, and a support stick. Tie the string to the weight and the stick. Place the float near one end of the pan of water. Bob the weight in the water to produce waves. Use the edge and corners of the pan as a reflector, and determine the different motions of the float.
2. Research the number and location of geosynchronous orbiting satellites. Locate their ground position on a globe, and determine their useful range.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Five-Meter Rope	Rubber Ball
Light Source With Reflector	Magnifying Glass

MATERIALS/CORE:

None

TOOLS AND EQUIPMENT/ADVANCED:

Pan for Water	Weighted Fishing Float
Stick	

MATERIALS/ADVANCED:

Water

APPLICATIONS OF TERMS:

Geosynchronous	Super High Frequency
Pulsed Radar	Low Frequency
Cycles Per Second	Doppler
High Frequency	Satellite Dish
Uplink	Ultra High Frequency
Phase Shift	Downlink
Waveguide	Coaxial
Repeaters	Teletext
Videotext	

REFERENCES:

Johnson, C. D., Communication Systems, South Holland, IL: Goodheart-Willcox Co., Inc., 1992.

Seymour, Richard D., John M. Ritz, and Florence A. Cloghessy, Exploring Communications, Goodheart-Willcox Co., Inc., 1987.

REFERENCE: 5.7

MAJOR TITLE: Communication Technology

UNIT TITLE: Introduction to Computers

MAJOR CONCEPT: Computers are an essential tool in our technological world.

TOPICS:
1. History and Development
2. Types of Computers
3. Basic Operation
4. Booting the System

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Identify the five generations of computers. (vacuum tubes, transistors, integrated circuits, microchip, and super computer)
2. Identify three types of computers. (main, mini, and micro)
3. Identify the basic components of a computer system. (monitor, keyboard, disk drive, processor, and printer)
4. Load and operate the system.

CORE INSTRUCTIONAL ACTIVITIES:
1. Discuss the development of the five generations of computers. (vacuum tubes, transistors, integrated circuits, microchip, and super computer)
2. Discuss three types of computers and their uses and applications. (main, mini, and micro)
3. Identify the basic parts of a computer system. (monitor, keyboard, disk drive, processor, and printer)
4. Boot the system with a disk.
5. Process information using a basic word processing program.
6. Print original designs using a graphic printing program.
7. Use a simulation program (computer software).

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Word process information using an advanced word processing program.
2. Create a budget using a spreadsheet.
3. Create a database.
4. Design a car utilizing a computer software program, and print the results.

EVALUATION:
Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
Computer
Disk Drive
Printer
Monitor

MATERIALS/CORE:
Computer Software
Paper
Ribbons

TOOLS AND EQUIPMENT/ADVANCED:
Same

MATERIALS/ADVANCED:
Computer Software

APPLICATIONS OF TERMS:

DOS	Printer	Disk Drive
CPU	Monitor	Input
Data	Memory	RAM
ROM	Program	Output
Warm Boot	Cold Boot	Processing
User Friendly	Artificial Intelligence	Keyboard
Programs	Storage	Transistor
Vacuum Tube	Integrated Circuit	Microchip
Supercomputer	Mainframe Computer	Minicomputer
Microcomputer		

REFERENCES:

Computer Software; can be found in any computer store, or check for similar MECC programs in your district.

Johnson, C. D., Communication Systems, South Holland, IL: Goodheart-Willcox Co., Inc., 1992.

Jones, Ronald E., and Janet L. Robb, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich, 1986.

South Carolina Guide for Basic Computer Literacy, South Carolina Department of Education, Office of Occupational Education, Columbia, SC, 1990.

REFERENCE: 5.8

MAJOR TITLE: Communication Technology

UNIT TITLE: Computer Software and Hardware

MAJOR CONCEPT: The computer consists of hardware that uses software to process information.

TOPICS:

1. Input, Process, Storage, and Output Devices
2. Memory
3. Buying and Copying Software

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Demonstrate the use of at least two of the following input devices: keyboard, joystick, mouse, touch tablet, and light pen.
2. Draw a block diagram of the basic function and makeup of a microprocessor.
3. Demonstrate the use of at least one of the following magnetic storage system/devices: floppy disk drive, hard disk drive, interactive video laser disk, or CD-ROM.
4. Demonstrate the use of at least two of the following output devices: monitor, printer (dot matrix, daisy wheel, thermal, laser, or ink jet), plotter, and/or modem.
5. Compare and contrast the differences in quality and permanence of print between a dot matrix, daisy wheel, thermal, laser, and ink jet printer.
6. Explain how magnetic storage systems work.
7. Handle a floppy diskette properly.
8. Identify various peripherals and their uses.
9. Describe how to purchase and legally copy software.
10. Explain applications of software in education.

CORE INSTRUCTIONAL ACTIVITIES:

1. Build a cardboard model of a computer large enough to walk through. Label all major parts. Use a string to trace a single piece of data through all the components.
2. Look at a microchip under a microscope. Draw and describe what you see.
3. Cut the envelope off a floppy diskette. Examine the rings under a microscope or strong magnifying glass. Note how the disk rings differ from those on a phonograph record.
4. Play, on a cassette recorder, a cassette tape that has data stored on it. Report on what is heard.
5. Use at least two of the following input devices to input data into the computer: keyboard, joystick, mouse, touch tablet, and light pen.
6. Draw a block diagram of the basic function and makeup of a microprocessor.
7. Use at least one of the following magnetic storage system devices to store information that you input into the computer from Activity 5 above: floppy disk drive, hard disk drive, interactive video laser disk, or cassette tape.

8. Use at least two of the following devices to observe output from the computer: monitor, printer (dot matrix, daisy wheel, laser, or ink jet), plotter, and/or modem.
9. Compare and contrast the differences in quality and permanence of print between a dot matrix, daisy wheel, thermal, laser, and ink jet printer.
10. Explain how magnetic storage systems work, and chart the path of information to and from the storage system.
11. Handle a floppy diskette properly.
12. Connect various peripherals to the computer properly.
13. Use a system master or other utilities disk to make a backup copy of a given disk.
14. Explain the term "Public Domain Software."
15. Use a computer magazine, and locate various software distributors. Write the names of the various distributors, and compare the prices each distributor indicates for a given software package.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Visit a computer store. Compare the same computerized games played on different brands of computers. Report your findings.
2. Use a word processing program to produce a form letter to advertise an upcoming school event.
3. Chart/Trace the development of the microchip.
4. Use a computer to chart the results of the findings in Activity 15.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Computer System (including a minimum of two disk drives, 128K, RAM, keyboard, CPU, monitor, printer/plotter, modem, joystick, mouse, touch tablet, and light pen)
Computer Paper
Cassette Recorder

MATERIALS/CORE:

Floppy Disks (blank)
System Master/Utilities Disk
Teacher-Made Instruction Sheet
Cassette Tape(s)
Transistors, Microchips, and Vacuum
Tubes
Cardboard
Computer Magazines
CD ROM Disk

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Software Packages

APPLICATIONS OF TERMS:

Hardware	Light Pen
Monitor	Peripheral
Microprocessor	CRT
Transistor	Printer
Computer Terminals	Microchips
Dot Matrix Printers	Silicon
Kilobyte (K)	Daisy Wheel Printers
Input Device	Random Access Memory (RAM)
Letter Quality	Read Only Memory (ROM)
Plotter	Thermal Printer
Membrane Keyboard	Floppy Diskette
Modem	Joystick
Disk	Database
Cursor	Cassette Tapes
Acoustic Coupler Modem	Mouse
Disk Drive	Direct-Connect Modem
Touch Tablet	Read/Write Head
Memory	Software
Byte	Bit
Binary Code	Data
Program	Processing
Output	Storage
Master Disk	Backup
Copy Protected	

REFERENCES:

Johnson, C. D., Communication Systems, South Holland, IL: Goodheart-Willcox Co., Inc., 1992.

Jones, Ronald E., and Janet L. Robb, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich, 1986.

Introduction to Computer Literacy, Columbia, SC: South Carolina Department of Education, Office of Occupational Education, 1990.

REFERENCE: 5.9

MAJOR TITLE: Communication Technology

UNIT TITLE: Computer Theory

MAJOR CONCEPT: Computer programming and languages make the computer a valuable tool in industrial technology.

TOPICS:
1. Process (input, process, storage, and output)
2. Binary Code
3. Initializing or Formatting a Disk
4. Programming Languages (PASCAL, COBOL, FORTRAN, BASIC, and LOGO)
5. Flow Charts
6. Programming Computers

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Identify processing. (input, process, storage, and output)
2. Count using the binary code.
3. Translate a binary code to a number.
4. Initialize a disk to store a program.
5. Identify five programming languages. (PASCAL, COBOL, FORTRAN, BASIC, and LOGO)
6. Load BASIC into the microprocessor.
7. Learn the BASIC commands, and run a BASIC program.
8. Run a graphic program from a LOGO tutorial program.

CORE INSTRUCTIONAL ACTIVITIES:
1. Discuss computer processing. (input, process, storage, and output)
2. Discuss the binary code to show how a letter is assigned to a binary number, and learn to count using the binary code.
3. Translate a binary code into a number.
4. Discuss initializing a disk, pointing out that the disk will be erased. (Initializing divides the disk into tracks, sectors, and blocks; and can install the DISK OPERATING SYSTEM on the disk.)
5. Load BASIC from ROM into the computer.
6. Enter a BASIC PROGRAM into the computer from a teacher-prepared worksheet.
7. Create graphics using a LOGO tutorial program.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Write a program in BASIC using the flowchart method.
2. Load the BASIC program into the computer, run it, and save it on a data disk.
3. Write your own program in LOGO to create a graphic idea.
4. Load the LOGO program into the computer and run it, and save it on a data disk.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Computer
Printer
Data Disk
Disk Drive
Monitor

MATERIALS/CORE:

Computer Paper
Paper

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Same

APPLICATIONS OF TERMS:

Boot	Warm Boot	Diskette
DOS	Disk Drive	Initialize
Crash	List	Run
Load	Return	Track
Sector	File	Block
Catalog	Error Message, I/O	BASIC
LOGO	FORTRAN	COBOL
Pascal	Clear	Home
Hideturtle	Showturtle	Draw
Clearscreen	Left	Right
Back	Forward	Penup
Pendown	Procedures	Primitives
DIR	CLS	VER
REM		

REFERENCES:

Johnson, C. D., Communication Systems, South Holland, IL: Goodheart-Willcox Co., Inc., 1992.

Jones, Ronald E., and Janet L. Robb, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich, 1986.

Introduction to Computer Literacy, Columbia, SC: South Carolina Department of Education, Office of Occupational Education, 1990.

REFERENCE: 5.10

MAJOR TITLE: Communication Technology

UNIT TITLE: Computer Applications and Impacts

MAJOR CONCEPT: The application of computer technology has had a major impact on society.

TOPICS:

1. Interface
2. Careers
3. Products
4. Economic
5. Political
6. Education

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Control a robotic arm, CNC milling machine, or other machine/equipment using the computer as a control and monitoring device.
2. Describe some of the major uses of computers.
3. Use a Computer Aided Drafting (CAD) system to demonstrate the impact of computer technology and the speed at which designs can be made, stored, and/or manipulated with the use of computers.
4. Use a Computer Numeric Control (CNC) machine to show the possibility of increased productivity in manufacturing as a result of computer technology.
5. Balance a checkbook with the computer to show the impact of computers in accounting and management.
6. Discuss in groups how computers have affected the way we work and the types of jobs we may have in the future. (e.g., Computer-controlled equipment is eliminating many jobs that are often unpleasant, dirty, and in many cases, unsafe. However, some new jobs have been created. The demand for electronic products such as computers and computer-controlled equipment is creating new service and repair jobs.
7. Use a computer tutorial, drill, and practice program.
8. Describe how computer technology has affected our economy.

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss and demonstrate some of the everyday uses for a computer (e.g., budgeting, spreadsheets, database, word processing, games, entertainment, simulations, and controlling).
2. Make a list of as many applications for a computer as you can find. Try to list at least 20 specific uses.
3. Use South Carolina Occupational Information System (S.C.O.I.S.) to find career opportunities in one of the following areas, and type a practice letter for an application for one of these interest areas using a computer (computer operators, computer programmers, systems analysts, computer service technicians, electrical engineers, salespeople, and manufacturers of computers.)

4. Interface, using the appropriate hardware/software, a robotic arm, CNC milling machine, or other machine/equipment using the computer as a control and monitoring device. Describe how this use of computers (interfacing with machines and/or tools) provides a possibility of increased productivity in manufacturing as a result of computer technology.
5. Use a Computer Aided Drafting (CAD) system to demonstrate the impact of computer technology and the speed at which designs can be made, stored, and/or manipulated with the use of computers.
6. Program and use a robot arm or Computer Numeric Control (CNC) machine to show the possibility of increased productivity in manufacturing as a result of computer technology (interfacing with machines/tools).
7. Balance a checkbook with the computer to show the impact of computers in accounting and management.
8. Discuss in groups how computers have affected the way we work and the types of jobs we will have. (e.g., Computer controlled equipment is eliminating many jobs that are often unpleasant, dirty, and in many cases, unsafe. However, some new jobs have been created. The demand for electronic products such as computers and computer controlled equipment is creating new service and repair jobs.)
9. Use a CAD system or appropriate software to plot a poster/banner depicting the various products produced by a computer or ones that have had a computer integrated somewhere in the process. (Stay within the bounds of a limited area such as entertainment, detection/control, computations, and data exchange.)
10. Use a computer to write a magazine article to publish in the classroom describing how computers have affected politics. (e.g., the speed of processing information and how the press uses that speed to their advantage . . . , bugging systems and pirating information to gather information, and how politicians can feed the public information at a much faster rate than ever before through the use of the computer, modem, and satellite combinations.)
11. Chart the sales of last year's computer hardware, software, or computer related products, and analyze the effect that these sales have had on our society. Document your findings on the computer, and store the information on disk and/or print it.
12. Use a modem to request and receive information from the International Technology Education Association (ITEA) on the applications of computers in education. Print the requested information, and post in the classroom or school lunchroom.
13. Use, in groups of two or more, a computer and a graphic printing program to design an 8.5" by 11" sign, letterhead, or greeting card. After printing the design on the printer, each student will reproduce the design using simple drafting tools (pencil, ruler, triangle, T-square, and drawing board) to show the speed and reproducibility that computer technology has provided in electronic communication.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Examine whether more stringent regulations should be placed on the choice of software and hardware for the medical industry in order to avoid wrong diagnosis of diseases caused by "bugs" in the software or malfunctions in the hardware. Provide evidence of your position, and provide possible solutions to overcome these possibilities.
2. Type a resume on the computer using a word processing program. *Use a CAD system or appropriate software to graph/plot the increase in computer-related jobs in the last 15 years.
3. Print and analyze results from the experiment using the Science Toolkit.
4. Use the computer to draw a block diagram on how the computer is used in Computer Aided walking, and explain how the computer "communicates" with the body to assist in walking.
5. Design a computer application where artificial intelligence may be used in the future. Chart career possibilities in the area of artificial intelligence.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Computer System
Computer Aided Drafting (CAD) System
Computer Numeric Control (CNC) Lathe/Mill System

MATERIALS/CORE:

"Science Toolkit" Software Package
Computer Paper
CAD Software
CAM Software
Wax, Metal, Wood, Plastic, or Other Machinable Material
Blank Disks
Plotter Pen Set

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Same

APPLICATIONS OF TERMS:

Input
Memory
Program
Binary Code
User Friendly
Computer Programmers
CAM
Systems Analysts
Computer Service Technicians
Byte
CNC
Data
Processing
Output
Computer
CAD
Supercomputers
Computer Operators
Bit
Electrical Engineers
Artificial Intelligence

REFERENCES:

Broderbund, 17 Paul Drive, San Rafael, CA 94903-2101.

Johnson, C. D., Communication Systems, South Holland, IL: Goodheart-Willcox Co., Inc., 1992.

Jones, Ronald E., and Janet L. Robb, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich, 1986.

S.C.O.I.S. is a computer network system used in South Carolina to gather information on job opportunities, schools, job prerequisites, etc. Contact your principal or local school district for more information.

Introduction to Computer Literacy, Columbia, SC: South Carolina Department of Education, Office of Occupational Education, 1990.

Xerox Educational Publications/Weekly Reader, Computer Software Division, 245 Long Hill Road, Middleton, CT 06457.

REFERENCE: 5.11

MAJOR TITLE: Communication Technology

UNIT TITLE: Video Production

MAJOR CONCEPT: Careful planning, organizing, and proper use of equipment is necessary to ensure that an audio/video production will flow easily and smoothly.

TOPICS:

1. Marketing Research
2. Program Planning
3. Script
4. Production Preparation/Job Interviews
5. Audio/Video Equipment

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Conduct a market research to identify an audience's needs and attitudes to better prepare program content. (e.g., Keep a diary of television viewing in the home for 3 to 7 days, and compile the results; OR research which students would like to purchase a school yearbook. Record whether you would be selling to majority girls/boys and young/old, which activities they enjoy the most, what types of programs they watch/listen to, favorite music/shows, etc., so that the broadcasting content can be better designed to communicate to the "big sale" group.)
2. Write a short radio and television script (to be produced in the following unit).
3. Identify the advantages/disadvantages of using video as opposed to using film in motion picture production.
4. Identify and explain the use of audio/video equipment and components.
5. Design a programming clock to identify the timing of the programming elements (news, commercials, music, etc.) that will be used in the audio/video production.
6. Identify, explain the responsibility of, and interview for the given audio/video production jobs. (see Activity #5)
7. Design the set/stage for an audio/video production.

CORE INSTRUCTIONAL ACTIVITIES:

1. Write a script for a 5-minute talk show, game show, and/or commercial containing both audio and video information (the words to be spoken, along with cues for music and sound effects, and any special directions necessary for the program).
2. Write a script for a radio program. Use the left 1/3 of the paper to identify the speaker, music, and the sound effects; and the right 2/3 of the paper to identify what is to be said, what music is to be played, and what sound effects are to be used. Special instructions are placed in parentheses and typed in all capital letters. Music is underscored with a solid line, and sound effects are typed in all capital letters and underscored with a dashed line.
3. Identify and explain the functions of the major components of a VCR system and cassette or reel-to-reel tape recording system.

4. Explain the advantages and disadvantages of using a video system as opposed to using film-type motion picture process. Discuss such areas as screen size, projection possibilities, speed or production, bulkiness, hardware, ease of use, handling of equipment and film/tape, loading and unloading film/tape, safety precautions, copying possibilities, and developing the image.
5. Identify and explain the responsibilities of the following jobs: director, assistant director, stage manager, set designers, set crew, cameraperson, assistant cameraperson, switcher, actors, emcee, and announcer. Interview (on tape) for the video production jobs.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Use a computer and software that can be used to produce drawings, and make a storyboard (a type of television script that includes drawings to help explain the video information in the program, thus, outlining the program's action with both pictures and written descriptions).
2. Produce a news broadcast with reports (local, state, and school), some weather, interviews, and sports to show during homeroom in the school.
3. Demonstrate and explain the characteristics and effects of audio energy as it collides with a surface. Set up an experiment on a test bed pointing a bell with a mailing tube around it toward the receiver (microphone). Have a reflector board set up at 90 degrees/perpendicular to the test bed. Angle the bell and receiver toward the reflector board at 15, 30, 45, 60, 75, and 90 degrees, respectively. Record the effects of various surfaces upon the reflection and refraction of audio energy (e.g., aluminum foil, white paper, and black paper).
4. Use a computer to plot the readings from the experiment in Number 10 using a different colored line for each transmitter setting.
5. Experiment to find the most efficient reflector shapes.
6. Use a computer aided design system to design the set/stage for an audio/video production.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

VCR System Including Camera, Video Recorder, TV/Monitor, and Videotapes
Record Player
Tape Recorder
Mixer, Jacks, and Microphones
CAD System

MATERIALS/CORE:

Chalk
Transparencies
Poster Board
Markers
Paper and Pencils
Batteries
Videotapes, Records, and Cassette Tapes

TOOLS AND EQUIPMENT/ADVANCED:
Same

MATERIALS/ADVANCED:
Same

APPLICATIONS OF TERMS:

Network	Close-Up (CU)
Zoom	Affiliate
Medium Shot (MS)	Storyboard
Full Shot (FS)	Disc Jockey
Commercials	Angle Shot
Newscaster	Commercial Stations
Public Stations	Freeze Frame
Actors	Content Area
On Camera (OC)	Actresses
Market Research	Pan
Camera Operators	Script
Voice-Over (VO)	Tilt
Director	Assistant Director
Stage Manager	Cue Cards
Announcer	Emcee
Stage Hands	Set Design
Commercial Production	Company
Countdown	Fade In
VCR	Fade-Out
Graph Paper	Turntable
Current	Tone Arm

REFERENCES:

Johnson, C. D., Communication Systems, South Holland, IL: Goodheart-Willcox Co., Inc., 1992.

Jones, Ronald E., and Janet L. Robb, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich, 1986.

REFERENCE: 5.12

MAJOR TITLE: Communication Technology

UNIT TITLE: Video Production

MAJOR CONCEPT: Careful planning, organizing, and proper use of equipment is necessary to ensure that an audio/video production will flow easily and smoothly.

TOPICS:
1. Audio/Video Instructions and Cues
2. Sound Effects
3. Audio/Video Equipment
4. Production and Setup of Stage Design
5. Recording/Editing/Producing

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Demonstrate the proper use of audio/video instructions and cues.
2. Produce both radio and television programs using videotape, cassette/reel-to-reel recording tape or integrated video laser disk.
3. Construct a stage/set for an audio/video production.
4. Record, edit, and produce a 5-minute talk show, game show, and/or/with commercial. (Include special effects and sound effects when appropriate.)

CORE INSTRUCTIONAL ACTIVITIES:
1. Use a VCR system and cassette or reel-to-reel tape recording system to produce a 5-minute talk show, game show, and/or commercial.
2. Watch a television commercial, and list as many video instructions as you can identify during the commercial.
3. Use the proper hand signal to communicate the following audio/video instructions and cues: slow down, speed up, 30 seconds to go in the program, 5 minutes to go in the program, 1 minute to go in the program, cut, cannot hear, too loud, too soft, stretch out the program, too much time left in the program, and too close to the microphone.
4. Use cardboard, plywood, shelving board, and the necessary tools/equipment and materials to assemble and construct a set/stage for an audio/video production. NOTE: The set should be designed during the previous unit on production planning.
5. Use a video camera to demonstrate how to make simpler "special effects" in the camera. (e.g., Use a VCR camera mounted on a tripod. Take a medium shot of two students walking toward each other. When the students are facing each other, each student raises his right hand to give a "high-five" by slapping their hands together in the air. The very moment the hands begin to make contact, press [or have another student press] the pause button/switch on the VCR or camera. NOTE: <u>Do not move the camera at all!!!</u> While the camera is still on pause, have the students leave the scene. When the students are completely out of the viewing range of the camera lens, and nothing in the set has changed, press the pause switch again (allowing the system to continue recording what the camera "sees." When played back it will appear that when the students slapped hands they disappeared.)

6. Demonstrate how to edit a scene by reshooting over old "footage." Shoot a scene with the camera and VCR system. Stop the tape and rewind back to a given point. Prepare the scene over again and begin acting. When the point in the scene begins to match where the recorder was stopped or rewound to, then quickly push the pause button (to begin taping again), and continue taping through the scene. The students may have to have more than a few takes to get the timing set properly, but they can manage with practice. NOTE: It may prove helpful to back the tape back to a place where the camera angle or scene changes so that the re-taping will hardly be noticed, if at all.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Record a demonstration of safety rules, measuring techniques, drafting techniques, etc., to be used as a teaching aid for classroom use.
2. Produce a news broadcast with reports (local, state, and school), some weather, interviews, and sports to show during homeroom in the school.
3. Demonstrate and explain the characteristics and effects of audio energy as it collides with a surface. NOTE: The recorder must have a VU meter integrated into the recording system to identify any meter deflection or differences in audio reception. Set up the experiment on a test bed by pointing a bell with a mailing tube around it toward a receiver (microphone) on the other end of the test bed. Have reflector board set up at 90 degrees perpendicular to the test bed and halfway between the transmitter (bell) and receiver (microphone). Angle the bell and receiver toward the reflector board at 15, 30, 45, 60, 75, and 90 degrees, respectively (using a protractor on each end may prove helpful). Record the VU meter readings on each degree of reflection, and chart these readings on a graph.
4. Record the effects of various surfaces upon the reflection and refraction of audio energy (e.g., aluminum foil, white paper, and black paper) using the test bed mentioned in Activity #3.
5. Use a computer to plot the readings from the experiment in Activity 5 using a different colored line for each transmitter setting.
6. Experiment to find the most efficient reflector shapes.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

VCR System Including Camera, Video Recorder, TV/Monitor, and Videotapes
Record Player
Taper Recorder
Mixer, Jacks, and Microphones
CAD System

MATERIALS/CORE:

Chalk
Transparencies
Poster Board
Markers
Paper
Pencils
Batteries
Videotapes, Records, and Cassette Tapes

TOOLS AND EQUIPMENT/ADVANCED:
Same

MATERIALS/ADVANCED:
Same

APPLICATIONS OF TERMS:

Network	Close-up (CU)
Zoom	Affiliate
Medium Shot (MS)	Storyboard
Full Shot (FS)	Disc Jockey
Commercials	Angle Shot
Newscaster	Commercial Stations
Public Stations	Freeze Frame
Actors	Content Area
On Camera (OC)	Actresses
Market Research	Pan
Camera Operators	Script
Voice Over (VO)	Tilt
Director	Assistant Director
Stage Manager	Cue Cards
Announcer	Emcee
Stage Hands	Set Design
Commercial Production	Company
Countdown	Fade In
VCR	Fade Out
Graph Paper	Turntable
Current	Tone Arm
	Footage

REFERENCES:

Johnson, C. D., Communication Systems, South Holland, IL: Goodheart-Willcox Co., Inc., 1992.

Jones, Ronald E., and Janet L. Robb, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich, 1986.

REFERENCE: 5.13

MAJOR TITLE: Communication Technology

UNIT TITLE: Video Production

MAJOR CONCEPT: Audio/Video production has had a major impact on career opportunities and effectiveness of communication.

TOPICS:
1. Impact of Audio/Video Production
2. Careers in Audio/Video Production

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Discuss some of the effects that audio/video has had on our society.
2. Identify some careers in audio/video production.

CORE INSTRUCTIONAL ACTIVITIES:
1. List and discuss how audio/video production has affected us; for example, it allows us to experience the sights and sounds of faraway places, learn about events almost immediately after they happen, and present fictitious situations as if they were real. It allows us insight into a variety of different customs, traditions, and styles, enhancing interpersonal relationships; it changes our entertainment activities, greatly increasing the processing time of recording images (as soon as the camera stops it is ready for playback); and it provides information storage techniques so that a graphic communication firm keeps all of its records on video files, allowing quick access and computer enhancement techniques to be used.
2. Use the *SOUTH CAROLINA OCCUPATIONAL INFORMATION SYSTEM (S.C.O.I.S.) to identify career opportunities in audio/video production.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Research a given career in audio/video production. Produce a video-tape simulation-type program where the student participates in role modeling as if s/he is an actual professional in the field of audio/video production. Demonstrate and/or report on the skills and/or knowledge used or needed for the particular career.
2. Make a chart that shows career opportunities in audio/video production, the educational or prerequisite requirements, and the yearly (or cost per job) salaries of each career listed.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

VCR System Including Camera, Video Recorder, and TV/Monitor
Record Player
Tape Recorder
Cassette Recorder
Recording Mixer With Jacks
Microphones

MATERIALS/CORE:

Poster Board
Colored Markers, Pencils, and Paper
Videotapes, Records, and Cassette Tapes

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Same

APPLICATIONS OF TERMS:

Network	Close-up (CU)
Zoom	Affiliate
Medium Shot (MS)	Storyboard
Full Shot (FS)	Disc Jockey
Commercial	Angle Shot
Newscaster	Commercial Stations
Public Stations	Freeze Frame
Actors	Content Area
On Camera (OC)	Actresses
Market Research	Pan
Camera Operators	Script
Voice Over (VO)	Tilt
Dolly	Fade-out
Fade-in	Zoom-in/out
Director	Assistant Director
Stage Manager	Cue Cards
Announcer	Emcee
Stage Hands	Set Design
Commercial Production	Company
Countdown	VCR
Turntable	Graph Paper
Tone Arm	Current
Pause	Record
Auxiliary	

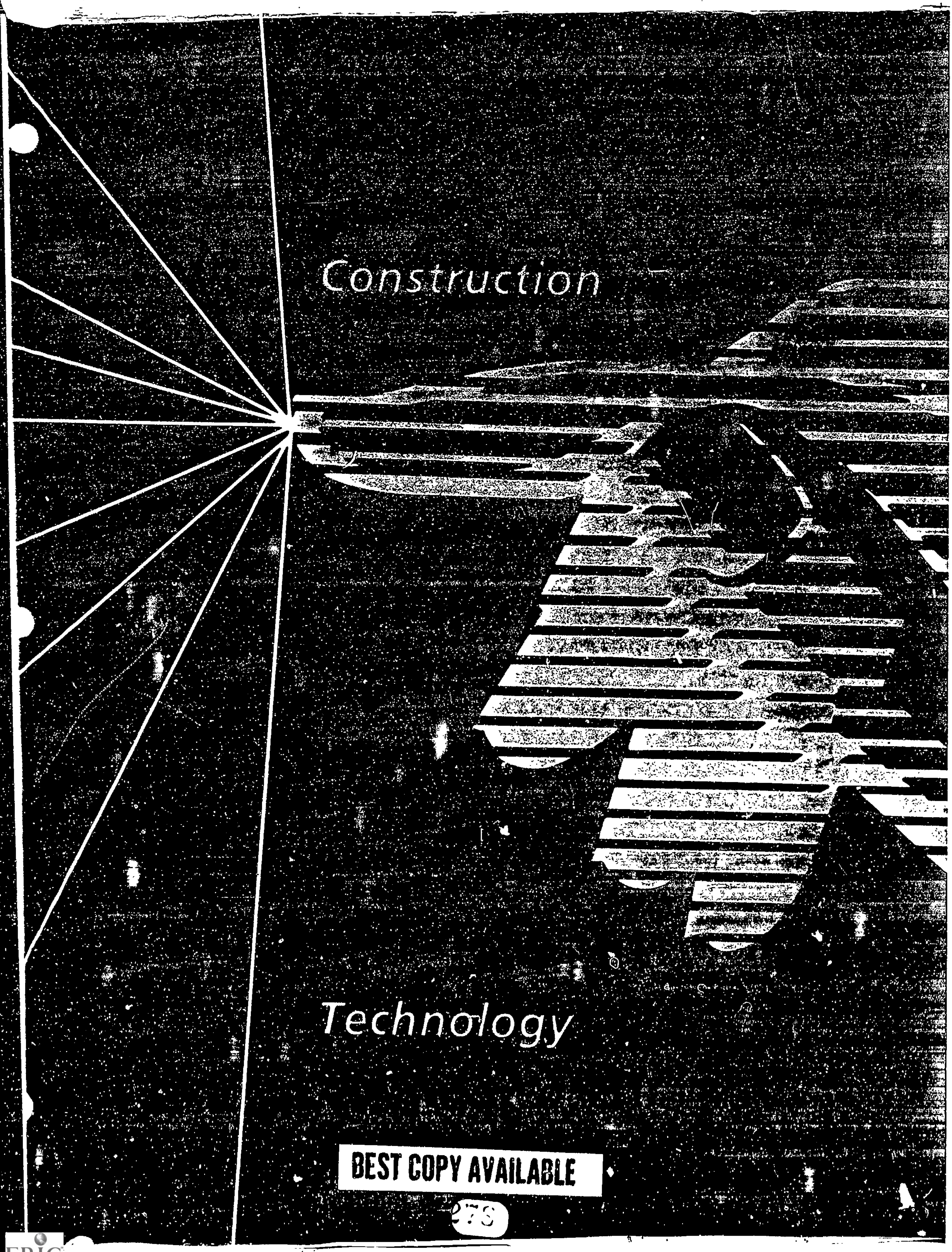
REFERENCES:

Johnson, C. D., Communication Systems, South Holland, IL: Goodheart-Willcox Co., Inc., 1992.

Jones, Ronald E., and Janet L. Robb, Discovering Technology Communication, New York, NY: Harcourt, Brace, Jovanovich, 1986.

*For more information on the SOUTH CAROLINA OCCUPATIONAL INFORMATION SERVICE (S.C.O.I.S.), contact your principal or your local school district office.

Construction



Technology

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UNITS FOR CONSTRUCTION TECHNOLOGY
RECOMMENDED INSTRUCTIONAL TIME

	9 WKS	18 WKS	36 WKS
1. Introduction to Construction Technology			
1.1 Products of Construction	1	1	1
1.2 Impact of Construction	1	1	1
2. Establishing and Maintaining a Construction Enterprise			
2.1 Planning the Enterprise	1	2	5
2.2 Organizing the Enterprise	1	2	4
2.3 Controlling the Enterprise	1	2	4
3. Selecting and Purchasing a Site			
3.1 Surveying and Mapping	1	2	5
3.2 Soil Testing	1	1	2
3.3 Securing a Site	1	2	4
4. Designing Construction Projects			
4.1 Idea Generation Through Sketching	1	2	4
4.2 Refining Design Solutions	1	2	4
4.3 Drafting Construction Plans	1	4	10
5. Engineering Construction Projects			
5.1 Engineering for Structural Integrity	1	2	5
5.2 Engineering Systems	1	4	8
6. Construction Production Technology			
6.1 Preparing for Construction	1	3	5
6.2 Setting Foundation	1	3	7
6.3 Building Superstructures	11	13	25
7. Installing Utilities			
7.1 Plumbing and Piping	1	2	5
7.2 Heating/Air-Conditioning/Ventilation	1	3	5
7.3 Electrical	1	2	5
7.4 Communication	1	2	4
8. Inspecting Construction Projects			
8.1 Building Codes and Permits	1	2	3
8.2 Conducting Inspections and Approval	1	2	4
9. Enclosing Structures			
9.1 Roofing	1	5	10
9.2 Exterior Walls	1	5	10
9.3 Insulating	1	3	6
9.4 Interior Walls, Floors, and Ceilings	1	5	10

	9 WKS	18 WKS	36 WKS
10. Finishing Structures			
10.1 Painting, Decorating, and Installing Accessories	1	4	8
11. Completing the Site			
11.1 Clean-up, Cutting Accesses, and Landscaping	2	2	4
12. Maintaining and Repairing Construction Projects			
12.1 Maintaining, Servicing, and Changing the Constructed Project	2	2	4
13. Exploring Construction Technology			
13.1 Future of Construction	3	4	8
TOTAL HOURS	45	90	180

REFERENCE: 1.1

MAJOR TITLE: Construction Technology

UNIT TITLE: Products of Construction

MAJOR CONCEPT: There are many types of constructed products.

TOPICS:

1. Construction for Living and Working (offices, homes, and churches).
2. Non-Dwelling Construction (dams, tunnels, highways, power transmission structures, monuments, factories, commercial buildings, and piping systems)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Describe five types of building construction products (houses, public service buildings, commercial buildings, high-rise buildings, and factories).
2. Describe six types of non-dwelling construction products (roadways, water control projects, piping systems, industrial complexes, electric power systems, and communication systems).

CORE INSTRUCTIONAL ACTIVITIES:

1. Divide the class into teams. Each team will make a chart which lists and describes five types of building construction products and six types of non-dwelling construction products.
2. Produce, in teams, a bulletin board using magazine pictures and words to describe five types of building construction products and six types of non-dwelling construction products.
3. Divide the class into teams for a contest. Build a house out of 2" x 3" tag board cards. Largest in 20 minutes is the winning house. Compare this with adobe, sod construction, and concrete block/mortar construction.

ADVANCED INSTRUCTIONAL ACTIVITIES:

Build models of types of structures.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

None

MATERIALS/CORE:

Magazines	Scissors (1/student)
Markers	Cardboard Base
Yardstick (1/team)	Glue
Stapler/Staples	Poster Paper (1/team)

2" x 3" Tag Board Cards or Index Cards
Construction Paper (to cover the bulletin board)

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TOOLS AND EQUIPMENT/ADVANCED:

Hammers
Crosscut Saws
Safety Glasses

MATERIALS/ADVANCED:

Wood Strips	Acetate Sheets
Pebbles	Glue
Brads	Scissors
Paper	Yard Sticks
Straws	

APPLICATIONS OF TERMS:

Structure
House
Public Service Buildings (schools, courthouses, and hospitals)
Commercial Buildings (office buildings, supermarkets, shopping centers, and banks)
Industrial Buildings (warehouses and factories)
High-Rise Buildings (offices, apartments, and hotels)
Roadways (railroads, highways, service roads, airport runways, bridges, and tunnels)
Water Control Projects (jetties, breakwaters, and dams)
Pipelines (sewer, natural gas, oil, and water)
Industrial Complexes (steel mills, paper mills, oil refineries, shipyards, electrical power stations, and electrical communication systems)

REFERENCES:

Geotsch, David T., and John A. Nelson, Technology and You, Albany, NY: Delmar Publishers, Inc., 1987.

Henak, Richard M., Exploring Construction, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

REFERENCE: 1.2

MAJOR TITLE: Construction Technology

UNIT TITLE: Impact of Construction

MAJOR CONCEPT: Construction technology has had a great effect on your life.

TOPICS:

1. Allows You to Live Anywhere, Travel, Buy Products That Are Transported, and Communicate Long Distances
2. Helps Countries Develop and Communities Grow
3. Provides Many Jobs/Careers

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. List and discuss at least four ways construction has affected his/her life (e.g., shelter, communication systems, transportation systems, and utility systems).
2. Explain and give examples of ways construction affects the development of nations and communities. (Examples: The Erie Canal and railroads helped pioneers move west. Dams control floods, provide power sources, aid agriculture, and provide recreational facilities. Roadways are necessary for industrial development.)
3. List and describe ten careers in construction.

CORE INSTRUCTIONAL ACTIVITIES:

1. Design, produce, and test two heating methods (fire and piped-in hot water). Tests will be conducted using three thermometers spaced at various distances in a metal container. Discuss the results of tests in terms of home construction requirements.
2. Compare and contrast life in a developed area (having high level construction technology) with life in an undeveloped area (lacking high level construction technology).
3. List examples of constructed products (roads, hospitals, recreational facilities, etc.) which meet the needs of people in your community. Discuss which needs the structures meet and how construction has changed your community in the past few years.
4. List and discuss jobs generated through the construction of your school building.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Report on a construction project which has helped a community or nation develop. Include positive and negative impacts.
2. Research and make a model of a structure utilizing a historically significant structural method. Using a time line, plot where this method fits historically among other structural methods.
3. Design and produce a primitive structure (tepee or beam bridge) and a more advanced structure (log cabin or truss bridge). Test, analyze, and compare the structural integrity of each (rain, wind, etc.).

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Hacksaw
Safety Glasses

MATERIALS/CORE:

<u>Dictionary of Occupational Titles</u>

Encyclopedias	Metal Container
Kindling	Matches
Thermometers (3)	PVC Cement
PVC Pipe and Joints	Tubing
Hot Water Source	

TOOLS AND EQUIPMENT/ADVANCED:

Backsaws
Safety Glasses

MATERIALS/ADVANCED:

Encyclopedias	Wood Strips
Glue	Dowels
Heavy Paper	Fan

Spray Bottle, etc. (depending on structures selected for Activity 3)

APPLICATIONS OF TERMS:

Architect	Engineer
Drafting Technician	Mason
Carpenter	Plumber
Electrician	Heating and Cooling Mechanic
Real Estate Agent	Wholesale Representative
Contractor	Subcontractor
Retail Representative	City Planner
Structural Steel Worker	Landscaper
Regional Planner	Insulation Worker
Glazier	Painter
Elevator Constructor	Laborer
Heavy Equipment Operator	Sheet Metal Worker
Plaster and Cement Finisher	Apprentice
Roofer	Manager
Surveyor	Interior Decorator
Foreman	Inspector
Cabinetmaker	Welder
Telephone Installer	

REFERENCE: 2.1

MAJOR TITLE: Construction Technology

UNIT TITLE: Planning the Enterprise

MAJOR CONCEPT: Construction planning involves deciding what is to be done, where it is to be done, when it will be done, and how it will be done.

TOPICS:
1. Formulating Goals
2. Researching the Proposed Project Requirements
3. Designing the Project
4. Engineering the Project

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Discuss the four parts of the planning phase (formulating, researching, designing, and engineering) of construction projects.
2. Implement these four phases in planning a construction project.

CORE INSTRUCTIONAL ACTIVITIES:
1. Formulate goals for a (model) pipeline project by asking such questions as...Do people need this construction project? Should the project be built? Can the project be built? Will the project add value to the community? Will it make money for the builder? Will it meet the needs of the owner? What must be its capacity?
2. Research information that will help make decisions about the construction project by testing the hardness of the soil from a mock site to determine the kind of foundation needed, testing the strength of various support designs to see what load (weight) they can support, and locating utility lines on the mock site.
3. Design the construction of the project after answering the questions in #1 and #2 by determining what purpose the structure will serve. Sketch several design solutions. Make a paper mock-up of the best solution.
4. Engineer the structure and choose the materials to be used to build it. Make refined sketches and a cost sheet. Identify and schedule the tasks which will be performed throughout the construction project.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Formulate goals for a model truss bridge project by asking such questions as...Do people need this construction project? Should the project be built? Can the project be built? Will the project add value to the community? Will it make money for the builder? Will it meet the needs of the owner? What must be its capacity?
2. Research information that will help in making decisions about the construction project by testing the hardness of the soil of a mock site to determine the kind of foundation needed, testing the strength of various truss designs to see what load (weight) they can support, and locating utility lines on the mock site.
3. Design the construction of the bridge project after answering the questions in #1 and #2. Sketch several design solutions.

4. Engineer the structure, and choose the materials to build it. Prepare refined sketches, and identify and schedule the tasks which will be performed throughout the construction project.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Hydraulic Trainer (adapted for load and soil testing)
Standard Equipment

MATERIALS/CORE:

Mock Site	Plastic Tubing/Fittings
Wood Strips	Wood Scrap
Concrete Block Scrap	Silicon Sealant
Metal Scrap	Glue
Pebbles	Paper
Tape	Rulers
Vise	

TOOLS AND EQUIPMENT/ADVANCED:

Standard Tools and Equipment

MATERIALS/ADVANCED:

Mock Site	Wood Scrap
Wood Strips	Concrete Block Scrap
Metal Scrap	Glue
Pebbles	Paper
Tape	

APPLICATIONS OF TERMS:

Research	Development
Formulate	Design
Architect	Engineer
Contractor	Initiate
Project	Objectives
Goals	Consultant
Criteria	Evaluate
Data	Compare
Contrast	Rate
Forecasting	Programming
Retrieving	Describing
Function	Postulating
Performance	Specification
Model	Solution-in-Principle
Scale Model	Prototype
Standard	Estimate
Scheduling	Experimenting
Girder Bridge	Cantilever Bridge
Arch Bridge	Suspension Bridge
Vertical Truss	Diagonal Truss
Warren Truss	Subdivided Warren
Pratt Truss	K-Truss

REFERENCE: 2.2

MAJOR TITLE: Construction Technology

UNIT TITLE: Organizing the Enterprise

MAJOR CONCEPT: The organizing phase of construction involves gathering the people, tools and equipment, resources, knowledge, and finances needed to begin a project.

TOPICS:

1. Structuring (arranging the stages of) a Construction Enterprise
2. Supplying (obtaining equipment, supplies, and workers for) a Construction Enterprise

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify work to be done and the people and materials needed to do it.
2. List and describe six necessary inputs for a construction project (finances, knowledge, resources, tools and equipment, energy, and personnel).
3. Order supplies and schedule equipment for a construction project.
4. Discuss five personnel practices (hiring, training, working, advancing, and retiring).

CORE INSTRUCTIONAL ACTIVITIES:

1. Plan the work to be done in constructing a model pipeline to carry oil across a mock site on a river, and identify the personnel and materials needed.
2. Identify and estimate the amounts of inputs (money, knowledge, resources, tools and equipment, energy, time, and personnel) necessary to build the project.
3. Order supplies and schedule equipment to build the pipeline.
4. Use the classified section of the newspaper to locate three construction job openings.
5. Fill out a job application form.
6. Set up criteria for hiring.
7. Role play a job interview.
8. Participate in an on-the-job training program for a class project (pipeline construction).

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Plan the work to be done in constructing a model bridge to bear a load (identified by the instructor) across a mock site having a river, and identify the personnel and materials needed.
2. Identify and estimate the amounts of inputs (money, knowledge, resources, tools and equipment, energy, time, and personnel) necessary to build the project.
3. Order supplies and schedule equipment to build the bridge.
4. Research hiring criteria and employer/employee expectations.
5. Design an on-the-job training program for a class project (bridge construction).

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

None

MATERIALS/CORE:

Classified Sections of Newspapers
Job Application Forms

TOOLS AND EQUIPMENT/ADVANCED:

None

MATERIALS/ADVANCED:

None

APPLICATIONS OF TERMS:

Organizing	Structuring
Equipment	Supplies
Tools	Machines
General Contractor	Subcontractor
Supplier	

REFERENCE: 2.3

MAJOR TITLE: Construction Technology

UNIT TITLE: Controlling the Enterprise

MAJOR CONCEPT: In the controlling phase management directs, monitors, reports, and corrects the progress of the project.

TOPICS:
1. Directing
2. Monitoring
3. Reporting
4. Correcting

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. List and discuss the applications of the four elements of the controlling phase of construction (directing, monitoring, reporting, and correcting).
2. Discuss what would happen to a construction project if it were not controlled.

CORE INSTRUCTIONAL ACTIVITIES:
1. Direct workers (tell them what, when, and how to do the work) on the pipeline construction project.
2. Monitor the work (keep the work on schedule and check work quality) on the pipeline construction project.
3. Report information (feedback) gathered during the monitoring phase about problems occurring during construction of the pipeline, so that corrections can be made.
4. Correct (take action to solve) the reported problems to save money and time on the pipeline construction project.
5. Construct the model pipeline, then discuss where more controls would have made the project better.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Direct workers (tell them what, when, and how to do the work) on the bridge construction project.
2. Monitor the work (keep the work on schedule and check work quality) on the bridge construction project.
3. Report information (feedback) gathered during the monitoring phase about problems occurring during construction of the bridge, so that corrections can be made.
4. Correct (take action to solve) the reported problems to save money and time on the bridge construction project.
5. Construct the model bridge, then discuss where more controls would have made the project better.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
Standard Tools and Equipment

MATERIALS/CORE:
Available Materials (Use whatever you can find that is appropriate.)

TOOLS AND EQUIPMENT/ADVANCED:
Standard Tools and Equipment

MATERIALS/ADVANCED:
Same

APPLICATIONS OF TERMS:

Management
Job Supervisor
Building Inspector
Time Clock
Building Codes
Inspection
Reporting
Testing
Monitor
Inventory Control
Superintendent
Timekeeper
Directing
Controlling

REFERENCE: 3.1

MAJOR TITLE: Construction Technology

UNIT TITLE: Surveying and Mapping

MAJOR CONCEPT: All construction is located on a site with features that must be surveyed or measured and then put on a map.

TOPICS:

1. Land Area Surveys
2. Topographic Surveys
3. Route Surveys
4. Hydrographic Surveys
5. Area Surveys
6. Construction Surveys
7. Locating Artificial Features on a Site

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Set up and use a transit to determine a given land area through triangulation.
2. Name six types of surveys.
3. Describe a survey party by listing members and their duties.
4. Identify the steps used in a survey sequence.
5. Calculate the acreage in a parcel of land.
6. Identify property boundaries using three methods (lot pins, meters and bounds, meridians, and base lines).

CORE INSTRUCTIONAL ACTIVITIES:

1. Identify land to be surveyed.
2. Set up a transit, and take readings to establish corners and other reference points on the land (laboratory may be used).
3. Discuss the six types of surveys and the job duties of survey workers.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Survey a plot as a survey party using a laser and traditional methods to set corner pins.
2. Draw a survey plot and write a legal description for the area. (Use this formula to calculate the acreages for square or rectangular areas: acres equals length in feet times width in feet, divided by 90,245 square feet. Use this formula to calculate the acreages for triangular areas: acres equal length of base in feet times height in feet, divided by 90,245 square feet.)
3. Make a contour map.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

- Level Rod
- Calculator
- Hammer
- Transit
- Stadia Rod
- Chain
- Stakes
- Surveyor's Tape
- Level Bar
- Level Bar Pin

MATERIALS/CORE:

None

TOOLS AND EQUIPMENT/ADVANCED:

- Optical Surveying Apparatus
- Laser Surveying Apparatus
- Drafting Tools

MATERIALS/ADVANCED:

- Field Notebook
- Grid Paper

APPLICATIONS OF TERMS:

- Aerial Surveys
- Bench Marks
- Chain
- Consultants
- Elevation
- Grid System
- Hydrographic Surveys
- Land Surveys
- Meridians
- Parallels
- Profiles
- Rectangular
- Route Surveys
- Survey Parties
- Topographic Map
- Triangulation
- Base Lines
- Chief
- Construction Surveys
- Contours
- Field Notebook
- Horizontal Control
- Instrument Assistant
- Laser Beam
- Monuments
- Plotting
- Recorder
- Resurveys
- Surveyor Helper
- Theodolite
- Transit
- Vertical Control

REFERENCE: 3.2

MAJOR TITLE: Construction Technology

UNIT TITLE: Soil Testing

MAJOR CONCEPT: Soil must be tested to determine the type of foundation needed.

TOPICS:
1. Reasons for Soil Testing
2. Soil Characteristics
3. Soil Analysis
4. Testing Methods

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Test soil for quality of bearing surface.
2. Experiment with soils for erosion resistance.

CORE INSTRUCTIONAL ACTIVITIES:
1. Using measuring devices, containers, and soil samples:
   - 1.1 Analyze two soil samples (clay and sandy soil) to find out if excavation facing is needed.
   - 1.2 Test two soils (clay and sand) for water absorption.
   - 1.3 Analyze the soil compaction of clay and sandy soils.
2. Perform tests to prove that when soil is removed from its original position, it becomes less stable. (Stream of water on excavated and unexcavated soil)
3. Discuss how foundation design is influenced by soil characteristics.

ADVANCED INSTRUCTIONAL ACTIVITIES:

Conduct the following field tests:
- a) Soil stability (plate bearing test)
- b) Settlement (plate bearing test)
- c) Impacting (density test)
- d) Depth of bedrock (geophysical test)

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Soil Tester
Split Barrel Soil Sample
Liquid-Limit Device

MATERIALS/CORE:

Brick	Sand
Clay	Paper Cups
Paper Towels	Various Types of Soil

TOOLS AND EQUIPMENT/ADVANCED:
- Soil Resistivity Meter
- Laboratory Soil Compactor
- Liquid-Limit Testing Device

MATERIALS/ADVANCED:
- Soil of Various Types
- Paper Cups

APPLICATIONS OF TERMS:

Bedrock	Boulder
Characteristics	Clay
Cobbles	Cohesive
Compressible	Cores
Density Test	Geophysical Test
Gravel	Heaving
Pilings	Load-Bearing Surface
Plasticity	Plate-Bearing Tests
Samples	Sand
Settlements	Shoring
Silt	Shakes
Soil Analysis	Soil Stability
Soil Testing	Surface Water
Test Pits	Voids
Water Table	Erosion

REFERENCE: 3.3

MAJOR TITLE: Construction Technology

UNIT TITLE: Securing a Site

MAJOR CONCEPT: The site must meet the needs of the client, and the project must be acceptable to the community.

TOPICS:
1. Acquiring Real Estate
2. Zoning
3. Estimating and Bidding

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Select a site for construction using a city/county map.
2. Determine if zoning laws permit building a given type of structure on the site (single family dwelling, commercial enterprise, etc.).
3. Determine ownership and availability of the site.
4. Estimate costs and prepare a bid.

CORE INSTRUCTIONAL ACTIVITIES:
1. Determine zoning restrictions, current ownership, site availability, utility availability, access, and practicality of building a single-family dwelling on a given site.
2. Estimate and prepare a bid based on the costs of the site, utilities, building permits, labor, and building schedule.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Propose solutions to a land use problem in the community (access, dwelling, and heavy industry).
2. Determine the needs (place, utilities, access, aesthetics, surrounding structures, space for structure and parking, available transportation systems, and soil characteristics) for an industrial structure.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

City/County Map
Title Records
Building Schedule
Blueprint of Dwelling
Zoning Codes
Utility Diagram
Pay Schedules

MATERIALS/CORE:

City/County Map
Title Records
Building Schedule
Blueprint of Dwelling
Zoning Codes
Utility Diagram
Pay Schedules

TOOLS AND EQUIPMENT/ADVANCED:

Environmental Impact Statement
Blueprint of Industrial Facility
Site Contour Map

MATERIALS/ADVANCED:

Environmental Impact Statement
Blueprint of Industrial Facility
Site Contour Map

APPLICATIONS OF TERMS:

Site
Area
Estimate
Clear Title
Utilities
Proposal
Competitive Bid
Aesthetics
Zoning Restrictions
Real Estate
Utilities
Bid
Building Schedule
Drainage
Access
Pay Schedule
Environmental Impact
Transportation
Title Search

REFERENCES:

Henak, Richard M., Exploring Construction, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

REFERENCE: 4.1

MAJOR TITLE: Construction Technology

UNIT TITLE: Idea Generation Through Sketching

MAJOR CONCEPT: Sketches allow designers to quickly explore many design possibilities.

TOPICS:
1. Developing Ideas Through Sketching
2. Refining Ideas
3. Identifying Problems
4. Selecting the Best Design
5. Sketching a Working Drawing

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Make sketches of a proposed project (supplied by teacher).
2. List and give the function of the materials needed to complete a project.

CORE INSTRUCTIONAL ACTIVITIES:

Sketch a single family dwelling or other structures.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Make a rough design using a Computer Aided Drafting (CAD) system to design a sports facility.
2. Make a rough design using a Computer Aided Drafting (CAD) system to design a public park.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

None

MATERIALS/CORE:

Grid Paper

TOOLS AND EQUIPMENT/ADVANCED:

Computer Aided Drafting (CAD) System

MATERIALS/ADVANCED:

Computer Paper

APPLICATIONS OF TERMS:

Functional	Client
Specification	Refine
Dimension	Analyze
Working Drawing	Section Drawing
Elevation Drawing	Civil Drawing
Mechanical Drawing	Architectural Drawing

REFERENCES:

Henak, Richard M., Exploring Construction, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

REFERENCE: 4.2

MAJOR TITLE: Construction Technology

UNIT TITLE: Refining Design Solutions

MAJOR CONCEPT: Refining a design is changing an existing design to better meet the needs of the construction project.

TOPICS:
1. Determining Design Change Needs
2. Developing Solutions and Alternate Solutions
3. Choosing the Best Solution

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Revise a given design of a construction project that is being planned for construction in the laboratory.
2. Discuss six steps in the design process (identify, develop, refine, analyze, select, and implement).

CORE INSTRUCTIONAL ACTIVITIES:
1. Refine the sketch of a single family unit made in previous unit.
2. Analyze the problems, offer alternate solutions, and sketch a polished design solution given a rough sketch of a dwelling construction project.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Use a Computer Aided Drafting (CAD) system to design the recreational facility for that completed in previous unit.
2. Analyze the problems, offer alternate solutions, and use a Computer Aided Drafting (CAD) system to produce a polished design solution given a rough sketch of a large construction project.

EVALUATION:
Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
Standard Drafting Tools and Equipment
Rough Sketch of Dwelling

MATERIALS/CORE:
Drafting Paper
Sketch Pad
Drafting Tape

TOOLS AND EQUIPMENT/ADVANCED:
Computer Aided Drafting (CAD) System
Rough Sketch of a Large Construction Project

MATERIALS/ADVANCED:
Printer Paper

APPLICATIONS OF TERMS:

- Analyze
- Architect
- Client
- Designing
- Engineer
- Implement
- Material
- Needs
- Working Drawing
- Scale
- Drawing to Scale
- Appearance
- Brainstorming
- Cost
- Design Process
- Function
- Limitation
- Model
- Specifications
- Dimensions
- Computer Aided Drafting (CAD) System

REFERENCES:

Henak, Richard, Exploring Construction, South Holland, IL: Goodheart-Willcox Co., Inc.

REFERENCE: 4.3

MAJOR TITLE: Construction Technology

UNIT TITLE: Drafting Construction Plans

MAJOR CONCEPT: Working drawings describe the physical details of a project such as size, shape, and placement on the land.

TOPICS:

1. Scale Drawings
2. Site Plan Drawings
3. Foundation Plan Drawings
4. Floor Plan Drawings
5. Elevation Drawings
6. Section and Detail Drawings
7. Reproduction of Drawings

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Interpret a scale drawing.
2. Name and define two types of drawings (working and shop).
3. Prepare working drawings from a sketch.
4. Reproduce drawings on a blueprint machine.

CORE INSTRUCTIONAL ACTIVITIES:

1. Read and discuss a given set of working drawings.
2. Sketch a site plan, floor plan, and/or elevation on grid paper.
3. Make a cardboard floor plan from project plans.
4. Reproduce drawings on a blueprint machine.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Prepare a set of working drawings to include foundation, floor, elevations, and detailed drawings using drafting tools or a Computer Aided Drafting (CAD) system.
2. Prepare a set of rendered display drawings of a constructed product.
3. Design a display model of a modern office building.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Drafting Equipment
Blueprint Reproduction Machine

MATERIALS/CORE:

Blueprint Paper
1/4" Grid Paper
Various Materials (paper, glass, plastic, chalk, etc.) for Models

TOOLS AND EQUIPMENT/ADVANCED:

Drafting Equipment
Computer Aided Drafting (CAD) System

MATERIALS/ADVANCED:

Various Materials (paper, plastic, paints, and chalk) for Renderings
Computer Printing Paper

APPLICATIONS OF TERMS:

Architectural Drawing	Site Plan
Shop Drawings	Engineering Drawing
Foundation Plan	Working Drawings
Elevations	Floor Plan
Blueprint	Computer Aided Drafting (CAD) System

REFERENCES:

Henak, Richard M., Exploring Construction, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

REFERENCE: 5.1

MAJOR TITLE: Construction Technology

UNIT TITLE: Engineering for Structural Integrity

MAJOR CONCEPT: Structures must be engineered to handle stresses.

TOPICS:
1. Material Analysis
2. Determination of Structural Requirements
3. Safety Factors

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Define structural integrity.
2. List the three areas in which a structure endures stress: innate weight, outside forces, and usage forces.
3. Define and discuss "safety factor."
4. Explain why a careful material analysis is necessary before attempting to engineer for structural integrity.
5. Compare different materials in terms of strength characteristics.

CORE INSTRUCTIONAL ACTIVITIES:
1. Use a paper straw, plastic straw, and copper tubing to illustrate the different points at which each loses its structural integrity. Test each for tensile, compression, and flexure strength using a spring or kitchen scale and attachments.
2. Use thin (less than 1 inch) strips of wood, plastic, etc., to illustrate collapse under innate weight. Support the strips at points farther and farther apart until the strip folds under its own weight or with a standard applied weight.
3. Drop a weight on the midpoint of the strip (in the above activity) to illustrate how outside forces and inertia affect structural integrity.
4. By asking "What if," student can soon convince himself/herself of the need for a safety factor. Recount for the student the balcony collapse in the hotel in Kansas City, MO. Discuss what should have been done to prevent this disaster.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Set up a bridge contest where the bridge may be made of any school supplies, and the winner will be determined by dividing the weight the bridge will support by the weight of the bridge, over a standard span.
2. Test woods, metals, plastics, ceramics, and concrete for the best ratio of flexure strength to material weight.
3. Create a miniature reinforced concrete beam using 1/8 inch reinforcement bar imbedded in a 1-inch square of concrete 10 inches long. Compare the flexure strength of the reinforced beam to that of a non-reinforced beam of equal dimensions.

EVALUATION:
Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
- Supports (sawbucks)
- Spring or Kitchen Scale

MATERIALS/CORE:

Copper Tubing	Plastic and Paper Straws
Wood Strips	Metal Strips
Plastic Strips	Ceramic Strips

TOOLS AND EQUIPMENT/ADVANCED:
- Forms for Pouring Concrete

MATERIALS/ADVANCED:
- Same (plus concrete strips and reinforcement bar)

APPLICATIONS OF TERMS:

Structure	Environmental Forces
Integrity	Load
Stress	Resistance
Function	Safety Factor
Analysis	Engineered
Tensile	Flexure
Compression	

REFERENCES:

Henak, Richard M., Exploring Construction, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

REFERENCE: 5.2

MAJOR TITLE: Construction Technology

UNIT TITLE: Engineering Systems

MAJOR CONCEPT: The systems utilized in a structure allow for operating effectiveness, efficiency, and comfort.

TOPICS:
1. Electrical Power Systems
2. Sanitation/Plumbing Systems
3. Climate Control Systems
4. Communication Systems
5. Transportation Systems
6. System Criteria

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Differentiate between the electrical, sanitation/plumbing, climate control, communication, and transportation systems.
2. Identify the function of each type of system.
3. Discuss the systems in construction projects.
4. Design, construct, and test one system used in construction.

CORE INSTRUCTIONAL ACTIVITIES:
1. Make a simple water system and test it for system integrity using 1/2" PVC pipe, fittings, and the lab spigot.
2. Participate in a classroom discussion to apply the above activity in achieving an understanding of how the system approach works no matter what material one is working with.
3. Construct an electrical circuit using 16/3 cable, a 10 amp. fuse and socket, an outlet and box, and a grounded plug. Plug in a hair dryer and then a "room" electric heater to illustrate "load" and "overload." This activity can be repeated using different sizes of cable and fuses to establish the requirements of the system.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Research the difference between nonautomated systems and automated systems. Discuss the findings with the class. (see system types in topics)
2. Construct a climate control system having automatic controls.
3. Design and install a plumbing system in a mock site. (A structure may not be necessary.)

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Hacksaw or Tubing Cutter	Soldering Gun
10" Pipe Wrench (2)	Wire Strippers
Linesworker Pliers (cutters)	3/16" Flat Tip Screwdriver
Heater	Plumber's Pressure Gauge
Safety Glasses	5000 B.T.U. Air-Conditioner (or smaller)

MATERIALS/CORE:

1/2" PVC Pipe	Grounded Plug
1/2" PVC Fittings	Fuse Socket
Water Supply	10 Amp. Fuse
PVC Solvent	Outlet Box
Grounded Outlet	Power Supply (outlet)
3/16" Cable	Piece of 1/2" Plywood
Wood Screws	PVC Cement
Solder	Solder Paste

TOOLS AND EQUIPMENT/ADVANCED:

Drill Press	Band Saw
Hole Saw	Twist Drill Bit
Hacksaw	Safety Glasses

MATERIALS/ADVANCED:

Mock Site	PVC Cement
1/2" PVC Pipe	1/2" PVC Fittings
Plumbing Fixtures	

Materials for Climate Control System According to System Design

APPLICATIONS OF TERMS:

System	Plumber's Pressure Gauge
Thermostat	Overload
Criteria	Efficiency
Rheostat	P.S.I.
Load	Effectiveness
Ohms	Solvent
Amps	Operating Sequence
Watts/Volts	Slope
Breaker	Climate
C.F.M. (air flow)	Integrity
Fuse	B.T.U.
Weight Limit	Resistance
Outlet	Heat
Lubrication	Service Box
Cool	

REFERENCE: 6.1

MAJOR TITLE: Construction Technology

UNIT TITLE: Preparing for Construction

MAJOR CONCEPT: The construction site must be prepared before a structure can be built.

TOPICS:
1. Clearing the Site
2. Locating the Proposed Structure
3. Excavating
4. Providing Temporary Utilities

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Identify obstacles which need to be removed from the construction site (stumps, boulders, garbage, etc.).
2. Survey the site, locating and marking the area to be excavated.
3. Excavate the site using model trucks, earth movers, etc.
4. Identify the means for providing temporary utilities on the site.

CORE INSTRUCTIONAL ACTIVITIES:
1. Remove obstacles from a mock site.
2. Survey the site using a laser or transit. Locate and mark the area to be excavated.
3. Excavate the mock site.
4. Provide temporary utilities for the mock site.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Use a transit, compass, and tape measure on the school grounds to locate a proposed structure according to the survey map furnished by the teacher.
2. Identify what would have to be done to prepare the site for construction.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Laser or Transit

MATERIALS/CORE:

Mock Site
Power Supply

TOOLS AND EQUIPMENT/ADVANCED:

Transit	Compass
Line Level	Tape Measure
Survey Map	String

MATERIALS/ADVANCED:
None

APPLICATIONS OF TERMS:

Utilities	Clearing
Demolishing	Earth Moving
Contouring	Level
Salvaging	Excavating
Degrees	Structure Locating
Disposing	Cutting
Batter Board	Soil Bearing Capacity

REFERENCES:

Henak, Richard M., Exploring Construction, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

Landers, Jack, Construction: Materials, Methods, Careers, South Holland, IL: Goodheart-Willcox Co., Inc., 1983.

REFERENCE: 6.2

MAJOR TITLE: Construction Technology

UNIT TITLE: Setting Foundations

MAJOR CONCEPT: Structures must have solid foundations.

TOPICS:
1. Bearing Surface
2. Footing
3. Substructures
4. Waterproofing and Damp Proofing

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Name the three elements of a foundation. (bearing surface, footing, and substructure)
2. Identify and provide an application for three types of footings. (spread, slab, and pile)
3. Discuss the steps of constructing a foundation for a dwelling and other structures.
4. Demonstrate one process of waterproofing and damp proofing.
5. Design and pour at least one footing.

CORE INSTRUCTIONAL ACTIVITIES:
1. Identify the elements of a foundation and the types of footings from a blueprint or other reference. Discuss potential applications of each type.
2. Seal all but one face of a cinder block with asphalting sealer. Place tissue paper beneath block, and drip water on unprotected face. Compare effect on tissue paper with the same procedure using an unsealed block.
3. Construct a scale model foundation on a mock site.
4. Experiment using different coatings on concrete blocks, and document the degree of success of each coating in waterproofing foundation walls.
5. Design a footing for a dwelling. Build forms, mix and pour concrete, and screed the surface. (NOTE: By pouring 1 1/2 in. thickness and placing Masonite dividers at suitable intervals, the footing can be broken into squares for patio or walkway use.)

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Discuss and name two reasons why a built-up aggregate is the only logical substructure for a highway. (drainage and expense)
2. Design, then excavate and pour miniaturized footings. (spread, slab, and pile)
3. Perform a concrete slump test.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

- Cement Container
- 1/16" Drill Bits
- Concrete Hoe
- Spatulas
- Trowels
- Buckets

MATERIALS/CORE:

- Blueprints
- Asphalt Sealer
- Cement Sealer
- Cement
- Cinder Blocks
- Asphalt
- Varnish
- Polyurethane
- Gravel
- Mock Site
- Forming Wood
- Silicone
- Paint
- Sand
- Wax Cups
- Paintbrushes

TOOLS AND EQUIPMENT/ADVANCED:

- Site Boxes
- Trowels
- Wood for Footings
- Cement Container
- Small Shovels
- Buckets
- Concrete Hoe

MATERIALS/ADVANCED:

- Masonite Sheets
- Form Wood
- Gravel
- Concrete

APPLICATIONS OF TERMS:

- Vibrating
- Screeding
- Bleed Water
- Slump
- Segregation
- Substructure
- Spread
- Raft
- Wall
- Pier
- Damp Proofing
- Aggregate
- Mason's Line
- Form
- Setting
- Edging
- Control Joint
- Troweling
- Parging
- Honeycombing
- Darbying
- Float
- Consistency
- Bearing Surface
- Footing
- Pile
- Foundation
- Column
- Waterproofing
- Built-Up
- Mortar
- Coarse
- Curing
- Hydration
- Exposed Aggregate
- Grooving
- Placing

REFERENCES:

Henak, Richard M., Exploring Construction, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

Landers, Jack, Construction: Materials, Methods, Careers, South Holland, IL: Goodheart-Willcox Co., Inc., 1983.

Reams, Jake, (1987), Cite (co-w-015), (co-w-016), (co-w-017), Ball State University, Muncie, IN 47306.

REFERENCE: 6.3

MAJOR TITLE: Construction Technology

UNIT TITLE: Building Superstructures

MAJOR CONCEPT: A superstructure is above grade construction.

TOPICS:
1. Mass Structures
2. Bearing Wall Structures
3. Framed Structures

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Identify and describe three kinds of superstructures (mass, bearing wall, and framed).
2. Demonstrate the application of three kinds of superstructures.

CORE INSTRUCTIONAL ACTIVITIES:
1. Build a mass structure (dam) on a mock site.
2. Build a miniature tilt-up bearing wall.
3. Build a miniature wood-framed wall section, floor section, and ceiling section.
4. Identify the construction techniques used to build the superstructure of the industrial technology facility.
5. Identify various types of superstructures in your community.

ADVANCED INSTRUCTIONAL ACTIVITIES:
Erect two steel column beams. Connect with an I-beam and appropriate flanges and bolts (first-time holes must be drilled and reamed with proper alignment).

EVALUATION:
Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
Standard Carpentry Tools

MATERIALS/CORE:

Cement	Mock Site
Gravel	Steel Rods (reinforcement concrete)
Mesh Wire	Glue
Brads	

TOOLS AND EQUIPMENT/ADVANCED:

Drill	Carbide-Tipped Bits
Ream	

MATERIALS/ADVANCED:

- Steel Columns (2)
- Flanges
- Pins
- I-Beam
- Bolts, Nuts, and Washers

APPLICATIONS OF TERMS:

- Girder
- Subfloor
- Sill
- Corner
- Sill Plate
- Fire Block
- Sill Shield
- Ceiling Joist
- Bridging
- Sheathing
- Rafter
- Gable Studs
- Collar Beam
- Roof Decking
- Angle Iron
- Riveting
- I-Beam
- Iron Worker
- Mason
- Tensile
- Flexure
- Chairs
- Asphalt
- Arches
- Cast
- Bearing Wall
- Tilt-Up Bearing Wall
- Header
- Sole Plate
- Stud
- Top Plate
- Let-In Brace
- Girder Pocket
- Floor Joist
- Plank
- Tongue and Groove
- Rafter Plate
- Hip Rafter
- Ridge Board
- Truss
- Square
- Bolting
- Welding
- Carpenter
- Contractor
- Compression
- Subcontractor
- Form
- Aggregate
- Mortar
- Lintels
- Mass
- Frame

REFERENCES:

Landers, Jack M., Construction: Materials, Methods, Careers, South Holland, IL: Goodheart-Willcox Co., Inc., 1983.

Lux, Donald G., et al., The World of Construction, Encino, CA: Glencoe Publishing Co., 1982.

REFERENCE: 7.1

MAJOR TITLE: Construction Technology

UNIT TITLE: Plumbing and Piping

MAJOR CONCEPT: Plumbing and piping are used to move liquids and gasses throughout a structure.

TOPICS:
1. Plumbing Systems
2. Plumbing Fittings and Piping
3. Jobs of a Plumber
4. Installing Plumbing Systems

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Identify plumbing fittings and piping.
2. Describe the jobs of a plumber and a pipe fitter.
3. Describe potable water systems, fire fighting systems, and wastewater systems.
4. Explain the process of joining copper, plastic, steel, and cast iron pipe.
5. Describe how to support piping.

CORE INSTRUCTIONAL ACTIVITIES:
1. Fit and join copper, steel, and/or iron pipe.
2. Support pipes and fittings onto a wall, ceiling, or floor.
3. Identify and use tools and equipment used in plumbing and piping.
4. Join copper and plastic pipe and fittings into a closed loop having a nipple that can be attached to a water supply or air compressor. Test the system for leaks with air before applying water.
5. Test the water pressure in school using a water pressure gauge.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Design a plumbing system for a house or office building.
2. Plumb a bathroom and kitchen, and install the fixtures.

EVALUATION:
Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Pipe Wrench	Pipe Dope
Pipe Die	Reducer
Pipe Hanger	Pipe Vice
Pipe Cutter	Round File
Pipe Reamer	Propane Torch
Steel Tape	Striker (for torch)
Try Square	Water Pressure Gauge
Air Compressor	Soldering Gun
Hacksaw	

MATERIALS/CORE:

Pipe (copper, plastic, steel, or cast iron)

Plastic Pipe Cement	Solder
Tees	Ells
Flanges	Bell End
Spigot End	Cutting Oil
Soldering Flux	

TOOLS AND EQUIPMENT/ADVANCED:

Same (plus drafting equipment)

MATERIALS/ADVANCED:

Sink	Toilet Fixture
Bathtub Fixture	Valves
Pipe/Fittings	Trap
Plumbing Drain	

APPLICATIONS OF TERMS:

Backing Boards	Bell Ends
Cemented Joints	Cleaning Drop
Fittings	Flow Test
Nipples	Pipe Fittings
Plumber	Potable Water
Roughing In	Sanitary Sewer
Solder	Spigot
Stand Pipe	Storm Sewer
Sweat Joints	Trap
Vent	Reducer
Ells	Tees
Vent	Pipe Hanger
Pipe Dope	Pipe Die
Flanges	Welding

REFERENCES:

Henak, Richard M., Exploring Construction, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

REFERENCE: 7.2

MAJOR TITLE: Construction Technology

UNIT TITLE: Heating/Air-Conditioning/Ventilation

MAJOR CONCEPT: Heating, air-conditioning, and ventilation systems are installed in structures to provide a comfortable and safe climate within.

TOPICS:

1. Heating Systems
2. Air-Conditioning Systems
3. Ventilation Systems

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. List five ways in which air can be changed or treated (heated, cooled, humidified, dehumidified, and filtered).
2. Discuss three devices that control temperature, humidity, or the flow of air in a room (thermostat, humidistat or humidity regulator, and damper).
3. Discuss conveying and recovery systems.

CORE INSTRUCTIONAL ACTIVITIES:

1. Demonstrate an air conveying system using a wet/dry vacuum cleaner.
2. Demonstrate a recovery system and filter system using a wet/dry vacuum cleaner.
3. Hang duct work from the ceiling or a framework to demonstrate installing ducts.
4. Demonstrate how air can be treated using a heating unit, cooling unit, humidifier, dehumidifier, and filtering unit.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Design a duct work system for exhausting fumes or dust from a machine in the laboratory.
2. Discuss how a thermostat works.
3. Design an air or liquid conveying system.
4. Design and make a humidifier, and test its effectiveness using a sling psychrometer.
5. Experiment with different types of heating units, and calculate the efficiency of each, e.g., forced hot air/water, electric coil convection, kerosene, conduction, radiation, and solar heat. (Heating units may be simulated by using inexpensive heating devices.)

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Framing Square	Wooden Mallet
Awl	Tinners Setting Hammer
Dividers	Hand Groover
Cold Chisel	Center Punch
Aviation Snips	Slip Roll
Pan Brake	Hand Seamer
Round Stake	Rivet Gun
Wet-Dry Vacuum Cleaner	

MATERIALS/CORE:

28 Gauge Sheet Metal	Scrap Soft Wood (2" x 4" x 12")
Boot (1 piece, 5" x 27.75")	Cap (1 piece, 4" x 13.5")
Duct (1 piece, 5" x 13")	Masking Tape
Rivets	

TOOLS AND EQUIPMENT/ADVANCED:

Sling Psychrometer
Sheet Metal Equipment (same)
Various Heating Devices
Thermostat

MATERIALS/ADVANCED:

See Heating/Air-Conditioning and Refrigeration Instructor at the Career Center for Materials, or Obtain/Fabricate Simulated Small Heating Units Used in a Much Scaled-Down "Living" Space.
Materials for Humidifier Depending on Design

APPLICATIONS OF TERMS:

Ventilating	Adhesives
Air-Conditioning	Metal Fastener
Humidity	Humidity Regulator
Dehumidifier	Damper
Treated Air	Draft
Polluted Air	Duct Work
Radiator	Exhaust
Pneumatic Conveying System	Pneumatic Recovery System
Fabricate	Ducts
Perimeter Heating	Metal Seams

REFERENCES:

Henak, Richard M., Exploring Construction, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

REFERENCE: 7.3

MAJOR TITLE: Construction Technology

UNIT TITLE: Electrical

MAJOR CONCEPT: Electrical systems distribute electricity throughout the structure to run appliances, machines, and other equipment.

TOPICS:

1. Electrical Power Systems
2. Panel Box
3. Branch Circuitry
4. Installing Electrical Power Systems
5. Color Coding
6. Electrical Codes

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify the components needed, and describe the order for installing a power system in a structure.
2. Describe the purpose and operation of a service panel box.
3. Explain what a branch circuit is.
4. List types of cable, junction boxes, switches, tubing, and receptacles.
5. Use the color coding system to identify wires.
6. Install electrical circuits.

CORE INSTRUCTIONAL ACTIVITIES:

1. Wire the following electrical circuits on a circuit board or simulated wall section:
   - 1.1 switch and lamp circuit
   - 1.2 switch, lamp, and receptacle circuit
   - 1.3 two 3-way switches and a lamp circuit
   - 1.4 two 3-way switches, one 4-way switch, and a lamp
   - 1.5 two 3-way switches, receptacles, and a lamp
2. Find the service wire to your school, and determine whether it has a two- or three-wire system.
3. Locate the circuit breaker or fuse box at your lab, and determine how many circuits it has. Determine the ampere rating of each circuit.
4. Make a list of materials used in a branch circuit in the school lab.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Plan and install three branch circuits for lamps, portable kitchen appliances, and a clothes dryer (30 amps). Include where the wires will go, type of cable to be used, parts to be used, and installation on a breadboard or wall section.
2. Research a local electrical code, and discuss the meaning of the requirements in class.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Wire Cutters
Claw Hammer
Steel Tape
Needle Nose Pliers
Staple Gun
Adjustable Wrench
Screwdrivers
Slip Joint Pliers
Wire Gauge
Side Cutting Pliers
Multimeter
Electric Drill
Hacksaw
Knife

MATERIALS/CORE:

Conduit
Various Switches
Junction Boxes
Wire
Circuit Breaker
Wire Nuts
Electrical Tape
Receptacles
Staples

TOOLS AND EQUIPMENT/ADVANCED:

Copies of Local Electrical Codes
Electrical Breadboard or Exposed Wall Section

MATERIALS/ADVANCED:

Same

APPLICATIONS OF TERMS:

Branch Circuits
Cable
Inspector
Junction Box
Knockouts
Load
Main Switch
Raceway
Service Panel
Ground Fault Circuit Interrupter
Conductors
Conductor Supports
Conduit
Controls
Circuit Breaker
Service Entrance
Color Coding

REFERENCES:

Henak, Richard M., Exploring Construction, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

REFERENCE: 7.4

MAJOR TITLE: Construction Technology

UNIT TITLE: Communication

MAJOR CONCEPT: Homes, schools, and office buildings must have a communication system.

TOPICS:
1. Wiring for Transmission of Sound, Video, and Sensor Information
2. Telephone Systems and Wiring Color Code
3. Monitoring Systems
4. Television Systems
5. Computer Systems
6. Intercom Systems

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Describe ways to transmit sound, video, and sensor information.
2. Design and wire a 2-button doorbell circuit.
3. Wire a two-way communication system.

CORE INSTRUCTIONAL ACTIVITIES:
1. Wire a sound system following a schematic.
2. Wire a doorbell following a schematic.
3. Wire a telephone circuit following a schematic.
4. Wire an intercom system following a schematic.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Design and wire a sound system.
2. Design and wire a doorbell circuit.
3. Design and wire a telephone circuit.
4. Design and wire an intercom system.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Basic Electricity Experiment Kit
Kit of Standard Electrical Tools

MATERIALS/CORE:

Coax Cable	Solder
Solderless Connectors	Electrician's Tape

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Same

APPLICATIONS OF TERMS:

Coaxial Cable	Communication
Sea Lanes	Computer Terminal
Easement	Intercom
Modem	Facsimile
Telephone Drop	Television Monitor
Radio Receiver	Mobile Unit
Jack	Microwaves
Satellite	Satellite Dish
Communication Satellite	Telegraph
Communication System	Radio Transmitter

REFERENCES:

Henak, Richard M., Exploring Construction, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

REFERENCE: 8.1

MAJOR TITLE: Construction Technology

UNIT TITLE: Building Codes and Permits

MAJOR CONCEPT: A builder must obtain a "building permit" before construction can begin.

TOPICS:
1. Building Codes
2. Zoning Laws
3. Permits
4. Legal Descriptions

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. List four types of zones (residential, commercial, industrial, and agricultural), and discuss the general specifications of each.
2. Identify ten building codes commonly used in many communities.

CORE INSTRUCTIONAL ACTIVITIES:
1. Discuss the nature of building permits and building codes.
2. Research and record ten building codes (rules) in your community or in a nearby community.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Explain how a building permit is granted.
2. Explain how the building codes keep structures in compliance with zoning ordinances.
3. Discuss the zoning for the area where you live or in the nearest community that has zoning codes.
4. Explain the way you would change the zoning in your city. (residential, commercial, industrial, and agricultural)

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Building Code Book
Zoning Law Book (nearest sizable community)

MATERIALS/CORE:

None

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

None

APPLICATIONS OF TERMS:

Code	Zoning
Residential	Commercial
Industrial	Agricultural
Site	Building Permit
Single Family Dwelling	Duplex Dwellings
Multiple Family Dwellings	Land
Deed	Legal Description
Lot Number	Plats

REFERENCES:

Henak, Richard M., Exploring Construction, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

REFERENCE: 8.2

MAJOR TITLE: Construction Technology

UNIT TITLE: Conducting Inspections and Getting Approval

MAJOR CONCEPT: Inspection begins when a building permit is issued and ends when the building is completed.

TOPICS:

Elements That Are Inspected (insulation, plumbing, framing, foundation, electrical, and septic tanks)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Name individuals or commissions that make inspections.
2. List steps for resolving financial claims due to structural faults.

CORE INSTRUCTIONAL ACTIVITIES:

1. Inspect the school building noting the following: materials used, methods used, and quality of work (structure, electrical, plumbing, and floor covering).
2. Write a warranty giving a guarantee that there are no defects.

ADVANCED INSTRUCTIONAL ACTIVITIES:

Develop an inspection checklist, and check the materials, methods, and quality pertaining to the school building (plumbing, electrical, structure, and floors).

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Building Code Manuals
Building Permit Examples

MATERIALS/CORE:

None

TOOLS AND EQUIPMENT/ADVANCED:

Building Code Manuals

MATERIALS/ADVANCED:

None

APPLICATIONS OF TERMS:

Approval Form	Certificate of Completion
Final Payment	Manuals
Material Inspection	Mechanic's Lien
Methods Inspection	Negotiation
Quality Inspection	Release of Claim
Release of Lien	Warranty

REFERENCES:

Henak, Richard M., Exploring Construction, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

REFERENCE: 9.1

MAJOR TITLE: Construction Technology

UNIT TITLE: Roofing

MAJOR CONCEPT: Roofs are essential to protect the inside of a structure from wind, rain, and snow.

TOPICS:

1. Built-Up Roofs
2. Types of Roof Coverings (shingle, felt paper, metal, asphalt and gravel, wood, tin, copper, and fiberglass)
3. Installing Roofs

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Discuss the advantages and disadvantages of a built-up roof.
2. List three types of roof coverings.
3. Install roofing shingles.

CORE INSTRUCTIONAL ACTIVITIES:

1. Determine what kind of roof your school has, and explain how it was installed.
2. Build a portion of a built-up roof in class.
3. Install various shingle types on a simulated roof section.

ADVANCED INSTRUCTIONAL ACTIVITIES:

Calculate shingle requirements for a 2,000 square foot home.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Basic Carpenter's Tool Kit

MATERIALS/CORE:

Roofing Materials
Nails
Staples
Adhesives
Plywood Sheet

TOOLS AND EQUIPMENT/ADVANCED:

Calculator

MATERIALS/ADVANCED:

Cedar for Shingles
Nails
Plywood Sheet
Roofing Felt

APPLICATIONS OF TERMS:

Flat Roof	Gravel
Valley	Pitched Roof
Gable	Built-Up Roof
Pliers	Gambrel
Roof Deck	Roofing Felt
Hip	Bitumen
Flashings	Mansard
Membrane	Insulation
Shed	Horizontal Gutter
Vapor Barrier	Shingles
Adhesive	Expanded Joints

REFERENCES:

Henak, Richard M., Exploring Construction, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

REFERENCE: 9.2

MAJOR TITLE: Construction Technology

UNIT TITLE: Exterior Walls

MAJOR CONCEPT: Structures are enclosed to keep out wind, rain, cold, sun, heat, and dust as well as to add beauty to the structure.

TOPICS:

1. Masonry
2. Wood
3. Paneling
4. Metal
5. Doors and Windows

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. List three materials used to enclose exterior walls.
2. Describe how doors and windows are installed.
3. Discuss exterior wall coverings for decoration and insulation.
4. Install a door and/or window.
5. Mix stucco and apply it to a concrete block wall.
6. Lay a portion of a brick wall.

CORE INSTRUCTIONAL ACTIVITIES:

1. Frame a door and/or window.
2. Install a door and/or window.
3. Mix stucco and apply.
4. Lay a portion of a brick wall.
5. Install a doorknob and/or deadbolt lock.
6. Install one quarter inch paneling on a wall section.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Enclose a curtain wall with drywall. Tape and finish the seams. (can be miniaturized)
2. Install a plain bevel, channel slip lock, tongue and groove, and/or board and batten siding.
3. Demonstrate the application of stucco.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Claw Hammer	Chalk Line	Masonry Trowel
Nail Set	Circular Saw	Level
Handsaw	Jig Saw	Framing Square
Back Saw	Router	Try Square
T-Bevel	Electric Drill	Combination Square
Block Plane	Reciprocating Saw	Staple Gun
Steel Tape	Screw Gun	Concrete Hoe
Concrete Mixing Tray	Lockset	Scaffold
High-Speed Drill Bits	Door/Window	

MATERIALS/CORE:

Brick	Wood	Stucco Cement
Paneling	Nails	Screws
Adhesives	Staples	Concrete Block
Cement	Sand	Gravel
Mortar		

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Same

APPLICATIONS OF TERMS:

Caulk	Curtain Walls	Rough Openings
Siding	Lintel	Common Brick
Threshold	Face Brick	Door Frame
Veneer	Window Frame	Mortar
Masonry Bricks	Bonds	Tooled Joints
Ribbon Stone	Scaffold	Bricklayers
Stucco Cement	Stretcher Bonds	Cored Block
Aggregates	Lapped Boards	Adhesives
Concrete Hoe	Masonry Trowel	Masonry
Router		

REFERENCES:

Henak, Richard M., Exploring Construction, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

REFERENCE: 9.3

MAJOR TITLE: Construction Technology

UNIT TITLE: Insulating

MAJOR CONCEPT: Insulation is used in a building to resist the flow of heat either into or out of a building to retard the spread of fire, to absorb noise, and to serve as a vapor barrier.

TOPICS:

1. Heat Transfer
2. Types of Insulation (reflective, rigid board, batts and blankets, and loose fill)
3. Installing Insulation
4. Vapor Barrier

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. List three types of heat transfer (conduction, convection, and radiation).
2. Explain the function of a vapor barrier.
3. Explain the function of weather stripping.
4. List four kinds of insulation.
5. Identify how insulating materials are grouped.

CORE INSTRUCTIONAL ACTIVITIES:

1. Demonstrate the three types of heat transfer using a small toaster oven or other heat source that illustrates conduction, convection, and radiation (see Activity 5).
2. Demonstrate the function of a vapor barrier.
3. Demonstrate the function of weather stripping.
4. Install various types of insulation on a simulated wall.
5. Make a small structure. Use insulating material from each insulation group to insulate the structure (mineral products, vegetable products, and metallic products).

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Design an insulation system which reduces conduction, convection, and radiation to control the flow of heat in a structure.
2. Test gypsum, fiberglass, wood, and metal to determine which is the best insulating material.
3. Research the function of a vapor barrier, and brainstorm ways to improve on existing technology. Write down ideas and present them to the class.
4. Experiment with different types and thicknesses of wall insulation, and record results. (Use a box frame that can be insulated using standard quantity of ice inside. Measure melting time.)

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

- Staple Gun
- Utility Knife
- Claw Hammer
- Steel Tape
- Toaster Oven
- Straight Edge
- Electric Drill

MATERIALS/CORE:

- Various Insulating and Non-Insulating Materials
- Staples
- Weather Stripping
- Masking Tape

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Same

APPLICATIONS OF TERMS:

- Batt/Blankets
- Insulation
- Loose Fill
- Heat Rays
- Rigid Board
- Weather Stripping
- Conduction
- Convection
- Radiation
- Heat Transfer
- Reflection
- Insulating Materials
- Condensation
- Porous
- Sealed
- Capacity
- Vapor Barrier
- Air Flow

REFERENCES:

Henak, Richard M., Exploring Construction, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

REFERENCE: 9.4

MAJOR TITLE: Construction Technology

UNIT TITLE: Interior Walls, Floors, and Ceilings

MAJOR CONCEPT: Interior wall, floor, and ceiling coverings improve appearance, provide sound insulation, and allow temperature control.

TOPICS:

1. Wall Coverings
2. Floor Coverings
3. Ceiling Coverings

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Install subflooring and underlayment.
2. Install drywall and fill the joints with tape and joint compound.
3. Install ceiling tile.

CORE INSTRUCTIONAL ACTIVITIES:

1. Install subflooring and underlayment on a joist frame.
2. Apply floor coverings to an underlayment.
3. Fasten gypsum wallboard to a wall section using nails, screws, staples, and/or mastic. Cover joints and dents with tape and joint compound. Finish the joints.
4. Install ceiling tile on a ceiling section.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Panel a wall section.
2. Apply ceramic tile to a floor and/or wall section.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Standard Carpenter's Tools Plus Spackling Trowel

MATERIALS/CORE:

Staples	Nails	Plywood Flooring
Molding	Ceiling Tile	Joint Compound
Sandpaper	Gypsum Wallboard	Joint Tape

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Wood Paneling	Plywood	Ceramic Tile
Ceramic Grout	Tile Mystic	

APPLICATIONS OF TERMS:

Plaster	Plasterboard	Wood Strip Floorings
Simulated Wood	Vinyl Coating	Adhesive
Furring Strip	Tile	Lath
Acoustic Tile	Mastic	Drywall
Translucent Panels	Subfloor	Resilient Flooring
Linoleum	Durability	Tongue and Groove
Shim	Trimming	

REFERENCES:

Henak, Richard M., Exploring Construction, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

REFERENCE: 10.1

MAJOR TITLE: Construction Technology

UNIT TITLE: Painting, Decorating, and Installing Accessories

MAJOR CONCEPT: A construction project is not complete until painting, decorating, and adding accessories has been done.

TOPICS:
1. Painting
2. Decorating (paneling, wall paper, carpet, etc.)
3. Installing Accessories (cabinets, kitchen accessories, bathroom accessories, electrical fixtures, etc.)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Paint a wall and ceiling section.
2. Carpet a floor section.
3. Install vinyl flooring.
4. Install wood trim.
5. Install a light fixture.

CORE INSTRUCTIONAL ACTIVITIES:
1. Apply paint to a ceiling/wall section.
2. Lay carpet on an underlayment of the floor section.
3. Measure, cut, and glue vinyl to an underlayment of the floor section.
4. Nail trim to the carpeted/linoleum covered section.
5. Wire a light fixture.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Hang wallpaper on a wall section.
2. Hang a premanufactured cabinet section.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Utility Knife
Mock Building
Roller With Handles
Steel Tape
Backsaw
Carpet Kicker
Light Fixture
Drop Cloth
Roller Pans

MATERIALS/CORE:

Carpet Nails
Paint
Vinyl
Mastic
Wire Nuts
Trim
Light Fixture
Ceiling Tiles
Carpet
Paintbrushes

TOOLS AND EQUIPMENT/ADVANCED:

Ladder
Wallpaper Water Tray

MATERIALS/ADVANCED:

Pre-Glued Wallpaper
Prefabricated Cabinet (possible class project)

APPLICATIONS OF TERMS:

Flush	Thinning
Solvent	Joint
Flow	Primer
Glossy	Flat
Enamel	Stroke
Drop Cloth	Overhang

REFERENCES:

Landers, Jack M., Construction: Materials, Methods, Careers, South Holland, IL: Goodheart-Willcox Co., Inc., 1983.

Lux, Donald G., et al., World of Construction, Encino, CA: Glencoe Publishing Co., 1982.

REFERENCE: 11.1

MAJOR TITLE: Construction Technology

UNIT TITLE: Cleaning Up, Cutting Accesses, and Landscaping

MAJOR CONCEPT: When the structure is complete the outside area must be cleaned of all debris, accesses cut, and grounds landscaped.

TOPICS:

1. Cleanup
2. Cutting Accesses
3. Landscaping

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Describe landscaping and its applications.
2. Design a landscaping plan.
3. List materials used for walkways, driveways, sidewalks, and platforms.
4. List tools and equipment used to clean up a site.
5. Specify plants and materials used as ground cover.

CORE INSTRUCTIONAL ACTIVITIES:

1. Landscape an area of the school.
2. Make a small walkway, sidewalk, driveway, or platform at the school; or perform these activities using a model (plaster of paris can be used).
3. Prepare a landscaping plan for a model home, office building, or industrial plant. Include slopes, accesses, sod, shrubs, trees, fountains, etc.

ADVANCED INSTRUCTIONAL ACTIVITIES:

Design a landscaping plan for the school.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Shovel	Hoe
Trowel	Garden Rake
Sandbox	

MATERIALS/CORE:

Concrete	Treated Lumber
Sod	Plants

TOOLS AND EQUIPMENT/ADVANCED:

Standard Drafting Equipment	Computer Aided Drafting (CAD) System

MATERIALS/ADVANCED:

Computer Paper	Drafting Paper

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APPLICATIONS OF TERMS:

Access	Cleaning	Final Earthwork
Fixtures	Ground Cover	Guy Wires
Landscape Plan	Landscaping	Mulch
Planting Schedule		

REFERENCES:

Henak, Richard M., Exploring Construction, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

REFERENCE: 12.1

MAJOR TITLE: Construction Technology

UNIT TITLE: Maintaining, Servicing, and Changing the Constructed Product

MAJOR CONCEPT: Maintaining, servicing, and changing the constructed product involves keeping the structure in good working condition and sometimes altering it to meet new conditions or consumer demands.

TOPICS:
1. Maintaining the Product
2. Repairing the Product
3. Protecting the Product
4. Altering the Product
5. Restoring the Product

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Draw up a schedule for servicing a given constructed product.
2. Discuss what restoring a structure might involve (teacher provides structure examples).
3. Make alterations to a project.
4. List three things that are involved in protecting a given constructed product (fences, patrols, and monitoring devices).

CORE INSTRUCTIONAL ACTIVITIES:
1. Plan a schedule for servicing a constructed product (e.g., school, home, or bridge).
2. Make alterations to a model structure.
3. Restore a model structure.
4. Draw up a protection plan for a constructed product.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Plan a servicing system to service a proposed project.
2. Draw a remodeling plan for the industrial technology lab to modernize it.
3. Make an estimate for interior repairs for a portion of the school.
4. Make an estimate for the exterior repairs for a portion of the school.

EVALUATION:
Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
Carpenter's Tool Kit
Electrician's Tool Kit
Plumber's Tool Kit
(other items depending on activity selected)

MATERIALS/CORE:
Materials (depending on activity selected)

TOOLS AND EQUIPMENT/ADVANCED:

Drafting Equipment
Computer Aided Drafting (CAD) System

MATERIALS/ADVANCED:

Drafting Paper
Material Price Catalogs

APPLICATIONS OF TERMS:

Servicing	Processing
Postprocessing	Operating
Maintaining	Repairing
Altering	Installing
Deterioration	Changing
Payback	Restoring
Warranty	Routine Maintenance
Schedule Maintenance	

REFERENCES:

CITE (CO-G-004) Estimating Interior Repairs and CITE (CO-G-006) Estimating Exterior Repairs, Ray Shakelford and Bruce Cannaday, Department of Industry and Technology, Ball State University, Muncie, IN 47306.

Henak, Richard M., Exploring Construction, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

REFERENCE: 13.1

MAJOR TITLE: Construction Technology

UNIT TITLE: Future of Construction

MAJOR CONCEPT: Three trends seem to be emerging in the construction industry: modular/prefabricated components, self-contained communities, and construction in space.

TOPICS:
1. Modular/Prefabricated Components
2. Self-Contained Communities
3. Construction in Space

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Discuss how the use of modular/prefabricated components combines manufacturing with construction processes.
2. List the advantages/disadvantages of self-contained communities.
3. Discuss the necessities for construction in space (travel, training, physical requirements, etc.).

CORE INSTRUCTIONAL ACTIVITIES:
1. Manufacture miniature roof trusses of various types, and install them on a model building.
2. Design a self-contained community.
3. Manufacture miniature components for a large space structure. Assemble them wearing a simulated space suit (wearing at least three layers of heavy clothing, a football helmet, and ski gloves or boxing gloves).

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Design, manufacture, and assemble modules for a miniature motel or hotel.
2. Design and build a miniature self-contained community.
3. Design and construct a large folding structure that could be unfolded to make a living area in space. Unfold it in simulated space gear. (See Activity 3.)

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Standard Construction Equipment

MATERIALS/CORE:

Wood Strips	Glue
Brads	Mock Structure
Heavy Clothes to Layer	Ski/Boxing Gloves

TOOLS AND EQUIPMENT/ADVANCED:
Standard Woodworking Equipment

MATERIALS/ADVANCED:

Lumber	Clothes to Layer
Screws	Glue
Ski/Boxing Gloves	

APPLICATIONS OF TERMS:

Self-Contained Community	Encapsulated
Modular	Laminates
Prefabricated	Precast

REFERENCES:

Henak, Richard M., Exploring Construction, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

NASA Publications, Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

Energy, Power and Transportation

Technology

BEST COPY AVAILABLE

UNITS IN ENERGY, POWER AND TRANSPORTATION TECHNOLOGY RECOMMENDED INSTRUCTIONAL TIME

		9 WKS	18 WKS	36 WKS
1.	Introduction to Power/Transportation			
1.1	Past, Present and Future	.5	1	3
1.2	Sources of Energy	.5	1	4
2.	Energy and Power			
2.1	Basic Terminology		2	4
2.2	Application of Energy	2	4	6
2.3	Measuring Energy and Power		2	4
2.4	Impact of Energy, Power, and Transportation on the Environment			3
3.	Control and Transmission of Power			
3.1	Mechanical Power	1	2	5
3.2	Fluid Power	1	4	6
3.3	Electrical Power	2	3	8
3.4	Automated Control Systems		2	5
3.5	Robotics	3	5	10
4.	Transportation			
4.1	Transportation Basics		2	6
4.2	Principles of Transportation		1	7
5.	Transportation Modes			
5.1	Highway	15	15	20
5.2	Rail		1	5
5.3	Air	2	2	6
5.4	Water		5	10
5.5	Pipeline	2	3	6
6.	Engines			
6.1	External Combustion		2	5
6.2	Internal Combustion	10	10	10
6.3	Automotive Engines		4	5
6.4	Small Internal Combustion Engines		10	15
7.	Advances in Power and Transportation			
7.1	Solar	3	3	7
7.2	Nuclear		1	4
7.3	Space Exploration	2	2	7
7.4	Emerging Systems		2	6
8.	Career Exploration and Planning			
8.1	Careers in Power/Transportation	1	1	3
	TOTAL HOURS	45	90	180

REFERENCE: 1.1

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Energy, Power and Transportation: Past, Present and Future

MAJOR CONCEPT: The sun is the basic source of the energy we have available for our use.

TOPICS:

1. Definition (Energy/Power)
2. How the Earth's Energy Came Into Existence
3. Past Sources
4. Present Sources
5. Future Sources

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Differentiate between energy and power.
2. Describe how the solar system serves as the source of all the energy that we use.
3. Trace the development of energy sources used in the home, industry, transportation, and defense, including future projections.

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss the five sources of energy and how each is converted to power (solar, chemical, geothermal, nuclear, and gravitational).
2. Bring in articles from publications which relate to each of the five basic sources.
3. Interview senior citizens on how changes in energy uses affected their lives.
4. Make a poster showing the development of one of the five sources of energy used in the home or industry.
5. Build a small, coil-type solar water heater.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Build a project, individually or in groups, tracing the development of energy used in the home, industry, transportation, or defense (including future projections).
2. Research and develop a short report on any one of the sources of energy.
3. Build a solar car using a small D.C. motor and solar cell.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Standard

MATERIALS/CORE:
- Aluminum Foil
- Tubing (rubber or plastic)
- Tubing Clamps
- Plexiglas
- Cardboard
- Black Spray Paint
- Trash Bag

TOOLS AND EQUIPMENT/ADVANCED:
- D.C. Motor
- Gears
- Plastic Wheels
- Solar Cells

MATERIALS/ADVANCED:
- Wood
- Cardboard

APPLICATIONS OF TERMS:
- Power
- Technology
- Fossil Fuels
- Crude Oil
- Geopressured Reserve
- Solar Energy
- Geothermal Energy
- Energy
- Radiant Energy
- Petroleum
- Refining
- Natural Gas
- Photovoltaic Cells

REFERENCES:

Bohn and MacDonald, et al., Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight Publishing Co., 1986.

Bohn and MacDonald, et al., Power and Energy Technology, Mission Hills, CA: Glencoe/McGraw-Hill, 1991.

Karwatka and Kozak, Energy, Power and Transportation, Orlando, FL: Harcourt, Brace, Jovanovich, Inc., 1987.

Schwaller, Anthony E., Transportation, Energy and Power Technology, Albany, NY: Delmar Publishers, Inc., 1989.

REFERENCE: 1.2

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Sources of Energy

MAJOR CONCEPT: Our three groups of energy sources are exhaustible, renewable, and inexhaustible.

TOPICS:
1. Exhaustible Energy Sources (those that cannot be replaced once used)
2. Renewable Energy Sources (those that can be used indefinitely if properly managed)
3. Inexhaustible Energy Sources (those that will always be available)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Define the terms exhaustible, renewable, and inexhaustible as they relate to energy sources.
2. Name four examples of exhaustible energy sources.
3. List two types of renewable energy sources (wood and plants).
4. List types of inexhaustible energy sources (solar, hydroelectric, wind, tides, ocean thermal, solar salts, hydrogen, and geothermal).
5. Describe and discuss the national/worldwide concern involving exhaustible energy sources.

CORE INSTRUCTIONAL ACTIVITIES:
1. Discuss and then list five examples of each type of energy source, and relate applications of each.
2. Research and report via poster, display, oral report, etc., on exhaustible energy sources.
3. Define exhaustible, renewable, and inexhaustible energy sources in a brief paper to be presented at the end of class.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Build a small working project that illustrates one of the renewable, exhaustible, or inexhaustible types of energy.
2. Demonstrate and experiment with various energy sources using power trainer.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Power Trainer (according to state equipment list)

MATERIALS/CORE:

None

TOOLS AND EQUIPMENT/ADVANCED:

Power Trainer (according to state equipment list)

MATERIALS/ADVANCED:
None

APPLICATIONS OF TERMS:

Exhaustible Energy Sources	Inexhaustible Energy Sources
Renewable Energy Sources	Synthetic Fuels
Nuclear Energy	Nuclear Reactor
Electrons	Neutrons
Protons	Gasohol
Methanol	Hydroelectric
Mineral Rights	Turbine
Ocean Thermal Energy	Fossil Fuels
Coal	Oil
Petroleum	Oil Pockets
Oil Shale	Tar Sands
Fractionating	Refining
Natural Gas	Geopressured Reserves
Tight Sand Reserves	Processing Plants
Synthetic Fuels	Uranium
Isotopes	Bioconservation
Photovoltaic Cells	Solar Panels
Turbines	

REFERENCES:

Bohn and MacDonald, et al., Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight Publishing Co., 1986.

Bohn and MacDonald, et al., Power and Energy Technology, Mission Hills, CA: Glencoe/McGraw-Hill, 1991.

Karwatka and Kozak, Energy, Power and Transportation, Orlando, FL: Harcourt, Brace, Jovanovich, Inc., 1987.

Schwaller, Anthony E., Transportation, Energy and Power Technology, Albany, NY: Delmar Publishers, Inc., 1989.

REFERENCE: 2.1

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Basic Terminology

MAJOR CONCEPT: An understanding of the basic terminology of power and energy is essential to the world of technology.

TOPICS:

1. Energy
2. Power
3. Work
4. Force
5. Efficiency
6. Prime Mover
7. Output Work
8. Input Work
9. AMA (Actual Mechanical Advantage)
10. TMA (Theoretical Mechanical Advantage)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Define the terms from topics list.
2. List at least four prime movers (wheel and axle, lever, inclined plane, screw, wedge, and pulley).
3. Use formulas to describe work, efficiency, theoretical mechanical advantage, and actual mechanical advantage.

CORE INSTRUCTIONAL ACTIVITIES:

1. Solve problems dealing with work, efficiency, theoretical mechanical advantage, and actual mechanical advantage using appropriate formulas.
2. Observe demonstration of a lever, and explain terms used in this section.
3. Report on practical uses of four prime movers.
4. Use a model car first with un-oiled axles, then oiled axles, to show the relationship between AMA, TMA, and variances thereof.
5. Write the definition of the topic words, and give examples.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Complete a worksheet of problems using the work, efficiency, and theoretical mechanical advantage formulas. (See references)
2. Perform experiments using theories of work efficiency, theoretical mechanical advantage, and actual mechanical advantage using the power trainer.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Lever
Model Car With Movable Axles
Oil/Graphite

MATERIALS/CORE:
None

TOOLS AND EQUIPMENT/ADVANCED:
Teacher-Prepared Worksheet on Mechanical Advantage Formulas
Power Trainer (see state equipment list)

MATERIALS/ADVANCED:
None

APPLICATIONS OF TERMS:
See Topics List

REFERENCES:

Bohn and MacDonald, et al., Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight Publishing Co., 1986.

Bohn and MacDonald, et al., Power and Energy Technology, Mission Hills, CA: Glencoe/McGraw-Hill, 1991.

Karwatka and Kozak, Energy, Power and Transportation, Orlando, FL: Harcourt, Brace, Jovanovich, Inc., 1987.

Schwaller, Anthony E., Transportation, Energy and Power Technology, Albany, NY: Delmar Publishers, Inc., 1989.

REFERENCE: 2.2

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Application of Energy

MAJOR CONCEPT: Application of energy for constructive use involves conversions from one form to another.

TOPICS:

1. History of Energy Applications
2. Conversions of Energy (examples provided)
   - 2.1 Mechanical (generator-mechanical to electrical)
   - 2.2 Thermal (thermocouple-heat to electrical)
   - 2.3 Light (photocell-light to electrical)
   - 2.4 Chemical (battery-chemical to electrical)
   - 2.5 Electrical (motor-electrical to mechanical)
   - 2.6 Nuclear (nuclear matter into heat energy)
   - 2.7 Radiant (sunlight-photosynthesis)
3. Control:
   - 3.1 Storage (potential)
   - 3.2 Law of energy conservation
   - 3.3 Conversion
4. Application (kinetic)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. List the seven forms of energy, and name the possible sources of each.
2. Differentiate between potential and kinetic energy.
3. Explain how friction reduces efficiency in energy control systems.
4. Describe how energy is stored and why storing it is important.
5. State the law of energy conservation.

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss and define the forms of energy found in the topics list.
2. Construct a reservoir with a turbine wheel to demonstrate conversion of potential energy to kinetic energy.
3. Use an electrical pump to move water from a lower level to a higher level, showing the conversion from kinetic to potential energy.
4. Show how a bicycle converts chemical energy into mechanical and heat energy.
5. Experiment with simple ways to unleash energy, e.g., solar cell motor, lemon battery, tea kettle pinwheel, and water to steam.

ADVANCED INSTRUCTIONAL ACTIVITIES:

Design an energy control system to show how friction reduces efficiency in an energy control system. (Example: Use various water piping systems to illustrate efficiency of water flow.)

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

- Bicycle
- Aquarium Pump
- Tea Kettle
- Zinc Strip
- Small Pinwheel
- Hand Pump (create water pressure)
- Solar Cell
- Copper Strip
- VOM Meter

MATERIALS/CORE:

- Batteries
- Plastic Trash Bag
- Lemons
- Sand
- Milk Carton

TOOLS AND EQUIPMENT/ADVANCED:

- PVC Pipe
- Various Fittings (ells, tees, Y's, and caps)

MATERIALS/ADVANCED:

- PVC Pipe
- Tape

APPLICATIONS OF TERMS:

- Mechanical
- Thermal
- Electrical
- Potential
- Kinetic
- Radiant
- Duration
- Application
- Efficiency
- Storage
- Hydraulics
- Law of Energy Conservation
- Chemical
- Light
- Nuclear
- Conversion
- System
- Placement
- Control
- Fuel
- Friction
- Transmission
- Energy Control System

REFERENCES:

Bohn and MacDonald, et al., Power and Energy Technology, Mission Hills, CA: Glencoe/McGraw-Hill, 1991.

Industrial Arts Instructional Tasks/Competencies for Power and Transportation Technology, Richmond, VA: Commonwealth of Virginia Department of Education: Vocational and Adult Education, 1984.

Industrial Technology Systems Handbook for Industrial Arts/Technology Education, Columbus, OH: Ohio Department of Education, Ohio State University, 1985.

Karwatka and Kozak, Energy, Power and Transportation, Orlando, FL: Harcourt, Brace, Jovanovich, Inc., 1987.

MacDonald, Bohn, Fales, and Kuetemeyer, Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight Publishing Co., 1986.

Schwaller, Anthony E., Transportation, Energy and Power Technology, Albany, NY: Delmar Publishers, Inc., 1989.

REFERENCE: 2.3

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Measuring Energy and Power

MAJOR CONCEPT: Work and power are measured to determine energy efficiency.

TOPICS:

1. Work = Weight X Distance
2. Horsepower = $\frac{\text{Weight (lbs) X Distance (ft)}}{\text{Time (sec) X 550}}$
3. Force = Pressure X Area
   3.1 Weight
   3.2 Torque
   3.3 Pressure
4. British Thermal Unit (B.T.U.)--Heat required to raise the temperature of 1 lb. of water 1 degree (F.)
5. Units of Measure
   a) English/Customary
   b) Metric

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Define power, force, work, torque, horsepower, pressure, and B.T.U.
2. Make use of the English/customary measuring system to solve problems.
3. Name and describe the three most common forms of power.
4. Explain the relationship between energy, work, and power.
5. Differentiate between force and torque.
6. Explain how pressure is measured and how it differs from force.

CORE INSTRUCTIONAL ACTIVITIES:

1. List and define power, force, torque, B.T.U., and horsepower.
2. Give examples of three common forms of power and where they are applied, e.g., electrical, electric motor; mechanical, lever and fulcrum; and chemical, battery.
3. Discuss the relationship between energy, work, and power.
4. Observe a teacher demonstration of power, work, torque, B.T.U., and horsepower using the power experimenter lab package as shown on the State Department of Education equipment list.
5. Work problems using both systems of measurement (English/customary and metric).

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Work problems dealing with force and pressure. (Students will perform experiments in section 3.2.)
2. Perform guided activities using power experimenter. (See Activity Guide.)

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Air Compressor
Hydraulic Pump
Stairs
Tape Measure
Stopwatch With Second Hand
Power Experimenter (according to state equipment list)
Dynamometer
Torque Wrench
Thermometer
Hot Plate

MATERIALS/CORE:

Balloon
Brick (weight)
Concrete Block (known weight)

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Worksheets on Problems Dealing With Force and Pressure (see reference)
Handout of Student Experiments to Be Done Using Power Trainer

APPLICATIONS OF TERMS:

Torque
Metric
Heat
Foot-Pounds
Dynamometer
Horsepower
Pressure
Work
Energy
BTU
SI (International System of Units)

REFERENCES:

Bohn, MacDonald, Fales, Kuelemeyer, Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight Publishing Co., 1986. (to include instructor's guide and activity guide)

Bohn and MacDonald, et al., Power and Energy Technology, Mission Hills, CA: Glencoe/McGraw-Hill, 1991.

Karwatka and Kozak, Energy Power and Transportation, Orlando, FL: Harcourt, Brace, Jovanovich, Inc., 1987.

Schwaller, Anthony E., Transportation, Energy and Power Technology, Albany, NY: Delmar Publishers, Inc., 1989.

REFERENCE: 2.4

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Impact of Energy, Power and Transportation on the Environment

MAJOR CONCEPT: Energy, power and transportation have an impact on the environment.

TOPICS:

1. Positive Effects (higher standards of living, lakes for recreation, and development of cleaner sources of energy)
2. Negative Effects (pollution: air, water, rain, destruction of natural land, and "sight" pollution)
3. Controlling Pollution
4. Conservation (saving energy and reducing pollution)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Describe how energy has raised our standard of living.
2. Define pollution.
3. Describe various types of air, water, and land pollution.
4. Define acid rain, describe how it forms, and explain the damage it causes.
5. Describe thermal pollution, and explain how it is harmful to fish and plant life.
6. Describe other forms of pollution caused by wood, geothermal power plants, hydroelectric plants, and nuclear power plants.
7. Discuss several ways that pollution caused by energy can be controlled.
8. Name ways to conserve energy at home and in business, industry, and transportation.

CORE INSTRUCTIONAL ACTIVITIES:

1. Find magazine pictures showing different types of pollution.
2. Discuss ways of controlling pollution.
3. Compare several different energy sources. Make a chart showing the least to most polluting type of energy.
4. Discuss acid rain's causes and effects.
5. Demonstrate and discuss ways to conserve energy.
6. Experiment with various pH waters to show the effects on plants.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Take a test of local rainwater, and test for acidity.
2. Take several tests of water from local areas and compare results.
3. Sprinkle a small amount of soot on a plant root, and observe results several days later.
4. Test the wattage used, and measure the light emitted from various combinations of light bulbs. Determine the most energy conserving combination for the identified tasks.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Fishbowl
Weed Killer
Light Meter
Boarderbaund Science Tool Kit
Hot Plate
VOM Multimeter

MATERIALS/CORE:

Live Plant
Poster Board
Markers
Westinghouse Information on Nuclear Waste
Magazines
Rubber Gloves

TOOLS AND EQUIPMENT/ADVANCED:

Test Tubes
Test Tube Rack
Test Tube Stoppers

MATERIALS/ADVANCED:

Litmus Paper
House Plant
Test Data Forms (graph paper)
Light Bulbs and Sockets

APPLICATIONS OF TERMS:

Environment
Fossil Fuels
Smog
Emission
Carbon Monoxide
Earth Warming
Greenhouse Effect
Cooling Towers
Hydroelectric Energy
Air Turbines
Nuclear Energy
Radioactivity
Energy Conservation
Weatherstripping
Pollution
Air Pollution
Hydrocarbons
Nitrogen Oxides
Particulates
Carbon Dioxide
Water Pollution
Geothermal Energy
Hydro-Pneumatic Power System
Receiver
Radioactive Waste
Solar Energy
Insulation
Double-Pane Windows

REFERENCES:

Bohn, MacDonald, Fales, Kuelemeyer, Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight Publishing Co., 1986. (to include instructor's guide and activity guide)

Bohn and MacDonald, et al., Power and Energy Technology, Mission Hills, CA: Glencoe/McGraw-Hill, 1991.

Karwatka and Kozak, Energy, Power and Transportation, Orlando, FL: Harcourt, Brace, Jovanovich, Inc., 1987.

Schwaller, Anthony E., Transportation, Energy and Power Technology, Albany, NY: Delmar Publishers, Inc., 1989.

REFERENCE: 3.1

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Mechanical Power

MAJOR CONCEPT: Mechanical power uses mechanical energy to do work through the use of simple machines, mechanical power systems, power transmissions, and friction.

TOPICS:

1. Mechanical Advantage
2. Simple Machines (lever, wheel and axle, pulleys, inclined plane, wedge, and screw)
3. Mechanical Power Systems
4. Power Transmissions and Friction

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Describe what is meant by mechanical advantage.
2. Identify the six simple machines.
3. Describe ways to change mechanical power such as on/off switches, gears, shafts, and pulleys.
4. Identify spur gear, bevel gear, miter gears, and worm gear sets.
5. Describe how power is lost in mechanical power transmission due to friction.

CORE INSTRUCTIONAL ACTIVITIES:

1. Have student observe experiments, then calculate mechanical advantages.
2. Solve problems determining mechanical advantage:

$$\frac{\text{Input Distance}}{\text{Output Distance}} = \frac{\text{Output Force}}{\text{Input Force}}$$

3. Find devices in home that use the principles of simple machines.
4. Have student describe how a clutch works in a power transmission by using friction.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Perform experiments in mechanical power using gears; pulleys and belts; sprockets; chains; clutches and couplings; on/off switches; changes in power, direction, and speed; and force changes.
2. Have student calculate mechanical advantage of a 10-speed bicycle.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Car Jack	Levers
Pulleys	Wheel and Axle
Worm Gears	Bevel Gears
Spur Gears	Miter Gears
Inclined Plane	Wedge
Ball Bearing	Needle Bearings
Power Trainer (according state equipment list)	

MATERIALS/CORE:

Sewing Thread Spools	Oil/Graphite
Bottle Caps (gears)	

TOOLS AND EQUIPMENT/ADVANCED:

Calculator	Computer

MATERIALS/ADVANCED:

Same

APPLICATIONS OF TERMS:

Mechanical Power	Machines
Simple Machines	Mechanical Advantage
Machine Output	Machine Input
Ratio	Lever
Pivot Point	Fulcrum
Force Lever Arm	Load Lever Arm
Wheel and Axle	Circumference
Revolution	Fixed Pulley/Movable Pulley
Inclined Plane	Wedge
Screw	Gears
Mechanical Power System	On/Off Switching
Reciprocating Motion	Rotary Motion
Linear Motion	Control Devices
Clutches	Couplings
Universal Joint	Power Transmission
Friction	Bearings

REFERENCES:

Bohn and McDonald, Power: Mechanics of Energy Control, Encino, CA: McKnight Publishing Co., 1983.

Bohn, MacDonald, et al., Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight Publishing Co., 1986.

Bohn and MacDonald, et al., Power and Energy Technology, Mission Hills, CA: Glencoe/McGraw-Hill, 1991.

Karwatka and Kozak, Energy, Power and Transportation, Orlando, FL: Harcourt, Brace, Jovanovich, Inc., 1987.

Schwaller, Anthony E., Transportation, Energy and Power Technology, Albany, NY: Delmar Publishers, Inc., 1989.

REFERENCE: 3.2

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Fluid Power

MAJOR CONCEPT: A fluid power system converts, transmits, controls, and applies energy through a pressurized system within a closed circuit.

TOPICS:
1. Parts of Fluid Power System
2. Types (pneumatic, hydraulic, and vacuum)
3. Theory of Operation
4. Application

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Identify and explain the function of each of the seven major parts of a fluid power system (fluid, receiver or reservoir, filler, pump or compressor, control valve, transmission lines, and actuator).
2. Explain the basic principles of pneumatics, hydraulics, and vacuums and how gauges are used to measure them.
3. Explain why hydraulic power is suitable in situations where large forces have to be applied or controlled.
4. Perform basic fluid power calculations.

CORE INSTRUCTIONAL ACTIVITIES:
1. Use a schematic of a typical fluid power system to identify the major parts of the system (after a demonstration).
2. Use the fluid power trainer to demonstrate the principles of pneumatics, hydraulics and vacuum, then discuss the application of each.
3. Discuss, using Pascal's Law, how a fluid is able to transmit force as well as change the relationship between force, distance, and speed. (See reference)
4. Make a display (poster or bulletin board) of pictures cut from magazines, etc., showing everyday use of fluid power.
5. Use fluid power gauges for measurement.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Assemble a basic or hydraulic system using syringes, tubing, fittings, and water.
2. Conduct experiments to determine various flows and pressures using the power trainer when given a schematic from the teacher.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Fluid Power Experimenter (according to state equipment list)

Thermometers (C/F)	Barometer
Hydraulic Jack	Air Compressor
Safety Glasses	

MATERIALS/CORE:
- Magazines
- Poster Board
- Teacher-Prepared Schematics (see references)

TOOLS AND EQUIPMENT/ADVANCED:
- Hypodermic Syringes
- Tubing Clamps
- Power Trainer
- Clear Plastic Tubing
- Assorted Tubing Fittings

MATERIALS/ADVANCED:
- Teacher-Prepared Schematics of Hydraulic System

APPLICATIONS OF TERMS:

Fluids	Hydraulics
Pneumatics	Vacuum
Volume	Cubic Feet
Cylinder	Pressurize
Piston	Compression
Boyle's Law	Transmission and Control
Valves	Reservoir or Receiver
Filter	Transmission Line
Actuator	Connectors
Pressure Relief Valve	Bellows
Air Over Oil	Air Inlet
Primary Filter	Storage Tank
Pressure Cylinder	Hydraulic Filter
Contaminants	Pneumatic Filter
Lubricator	Gear Pump
Valve Pump	Compressor

REFERENCES:

Bohn, Fales, et al., Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight Publishing Co., 1986.

Bohn and MacDonald, et al., Power and Energy Technology, Mission Hills, CA: Glencoe/McGraw-Hill, 1991.

Karwatka and Kozak, Energy, Power and Transportation, Orlando, FL: Harcourt, Brace, Jovanovich, Inc., 1987.

Nolansky, Nagohusian, and Henke, Fundamentals of Fluid Power, Albany, NY: Lab Volt Technical Systems.

Schwaller, Anthony E., Transportation, Energy and Power Technology, Albany, NY: Delmar Publishers, Inc., 1989.

Suess, Dugger, et al., Introduction to Power System, Reston, Virginia: ITEA, 1985.

REFERENCE: 3.3

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Electrical Power

MAJOR CONCEPT: An operating electrical power system has electricity traveling from a power source through control components to a work load and returning to the power source.

TOPICS:

1. Safety
2. Sources and Types of Electricity (chemical, light, pressure, heat, and magnetic)
3. Basic Laws of Electricity
4. Electrical Components
5. Circuits
6. Measurements and Calculations

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Demonstrate safe procedures in dealing with electricity.
2. Explain AC and DC.
3. Explain the relationship between magnetism and electricity.
4. Name 3 conductors and 3 insulators (e.g., conductors: copper, silver, and aluminum; insulators: glass, plastic, and wood).
5. Identify 2 functions of electrical components (e.g., resistance, switching, storage, amplification, and converting AC to DC).
6. Explain and use Ohm's Law and Watt's Law.
7. Explain amps, ohms, and volts.
8. Construct an electrical circuit.
9. Use a VOM to measure amps, ohms, and volts.
10. Explain operation of generators and motors.

CORE INSTRUCTIONAL ACTIVITIES:

1. Perform experiments using the trainer to show:
   1.1 Differences between parallel and series circuits
   1.2 Proper use of meters
   1.3 Ohm's Law
2. Demonstrate sources of electricity (chemical-battery and solar-photovoltaic cell).
3. Demonstrate function of commonly used electrical components (switching, resistance, fuses, relays, etc.).
4. Use experiments to show difference between AC and DC (oscilloscope-basic experiments).
5. Complete a worksheet of basic electrical problems.
6. Pass a teacher-prepared safety test.
7. Use a volt ohmmeter to determine the conductivity and insulation quality of various materials.

ADVANCED INSTRUCTIONAL ACTIVITIES:
Disassemble an electric motor and generator, identify components, explain functions of each, and reassemble.

EVALUATION:
Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
Electronics Trainer (according to state equipment list)
Voltmeter/Ohmmeter
AC/DC Power Supply

MATERIALS/CORE:
Hookup Wire
Miniature Bulbs (1.5v)
Batteries

TOOLS AND EQUIPMENT/ADVANCED:
Needle Nose Pliers
Crescent Wrench
Wrench Set
Generator
Screwdriver
Socket Set
Ball Peen Hammer
Electric Motor

MATERIALS/ADVANCED:
None

APPLICATIONS OF TERMS:
Alternators
Amperage
Batteries
Charged Particles
Collector
Coulomb
Direct Current (DC)
Electromagnet
Elements
Fuses
Hole Theory
Magnetism
Ohm's Law
Parallel Circuit
Primary Cell
Relays
Secondary Cell
Series Circuit
Solenoid
Terminals
Transformer
Variable Resistor
Wattage
Alternating Current
Base
Cells
Circuit Breakers
Conductor
Diode
Electrolyte
Electron Theory
Emitter
Generators
Insulator
Motors
Overload Control
Permanent Magnets
Rectification
Resistance
Semiconductor
Slip Rings
Switches
Toggle Switch
Transistor
Voltage

REFERENCES:

Bohn, MacDonald, et al., Energy, Power and Transportation, Encino, CA: Bennett and McKnight Publishing Co., 1986.

Bohn and MacDonald, et al., Power and Energy Technology, Mission Hills, CA: Glencoe/McGraw-Hill, 1991.

Karwatka and Kozak, Energy, Power and Transportation, Orlando, FL: Harcourt, Brace, Jovanovich, Inc., 1987.

Schwaller, Anthony E., Transportation, Energy and Power Technology, Albany, NY: Delmar Publishers, Inc., 1989.

Smith, Howard, Exploring Energy Sources/Application/Alternatives, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

REFERENCE: 3.4

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Automatic Control Systems

MAJOR CONCEPT: Automated control is continuous automatic operation for the most efficient use of energy.

TOPICS:
1. Automated Systems
2. Instruments and Sensors
3. Computers and Robots
4. Impact on Society

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Explain an automated control system.
2. Explain how computers improve automated control systems.
3. List the advantages and disadvantages of robots as an industrial labor supply.
4. List and explain how sensors are used in automated systems.
5. Describe an automated control system operating at home.

CORE INSTRUCTIONAL ACTIVITIES:
1. Discuss automatic controls or controlled devices in homes (thermostats, washing machines, etc.).
2. Build a thermostat-regulated circuit.
3. Build a timer-operated system, and apply it to a device such as a radio or light.
4. Assemble an electric circuit using a photovoltaic cell and timer.

ADVANCED INSTRUCTIONAL ACTIVITIES:
Build a fire alarm system using the electrical experimenter.

EVALUATION:
Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Assorted Electrical Hand Tools	Robot Kits
Electrical Experimenter	Heat Lamp

MATERIALS/CORE:

Thermostat	Sensor
Power Supply	Conductor
Insulator	Solar Kit
Transformer	Timer
Capacitor	Diode

TOOLS AND EQUIPMENT/ADVANCED:
Electrical Experimenter (according to state equipment list)

MATERIALS/ADVANCED:

Computer Software

Milling Material

APPLICATIONS OF TERMS:

Artificial Intelligence
Automation
Bits
Computer
Computer Aided Manufacturing
Memory
Data Processing
Microcomputer
Software
Personal Computer
Microprocessor
Robot
Automated Control Systems
Central Processing Unit
Byte
Computer Aided Design
Automated Manufacturing Devices
Computer Printout
Expert System
Information Management
Output Devices
Sensor
Mainframe Computer

REFERENCES:

Bohn, MacDonald, et al., Energy, Power and Transportation, Encino, CA: Bennett and McKnight Publishing Co., 1986.

Bohn and MacDonald, et al., Power and Energy Technology, Mission Hills, CA: Glencoe/McGraw-Hill, 1991.

Karwatka and Kozak, Energy, Power and Transportation, Orlando, FL: Harcourt, Brace, Jovanovich, Inc., 1987.

Schwaller, Anthony E., Transportation, Energy and Power Technology, Albany, NY: Delmar Publishers, Inc., 1989.

Smith, Howard Bud, Exploring Energy Sources/Application/Alternatives, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

REFERENCE: 3.5

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Robotics

MAJOR CONCEPT: Robotics is the field of study that involves combining electromechanical devices with a controller to perform repetitive tasks.

TOPICS:

1. History of Robotics
2. Basic Operating Principles
3. Actuators for Robots
4. Controlling Devices
5. Applications of Robots

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Trace history and application of robots.
2. Define robotic terminology.
3. Outline and diagram the work envelope for a robot.
4. Identify the basic operating systems of a robot.
5. Describe the function of robots in American history.
6. List advantages and disadvantages of replacing workers with robots.
7. Explain sensing systems used in making robots "intelligent."
8. Identify common controllers used to operate robots.
9. Operate a robot to simulate an industrial application.

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss robotic terminology.
2. Demonstrate and operate a robot to determine its work envelope.
3. Compile a work list of robotic operations.
4. Debate the advantages and disadvantages of robots.
5. Prepare poster depicting systems of a robot.
6. Construct a time line showing the history and development of robotics.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Program a robot to simulate an industrial application of a robot.
2. Perform experiments in interfacing sensing and output devices to a computer.
3. Debate the advantages and disadvantages of replacing workers with robots.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Computer
Robot Trainer (according to state department equipment list)
Experimenter Board Interfaced With Computer

MATERIALS/CORE:

Electrical Hookup Wire
Blocks
Friction Tape

TOOLS AND EQUIPMENT/ADVANCED:

Miscellaneous Sensing Devices (thermistor, mercury switches, humidistats, and sliding potentiometers)
Miscellaneous Output Devices (solid state relays, light emitting diodes, low voltage motors, light bulbs, solenoids, and buzzers)
Robotic Arm and Teach Pendent (interface)
Computer and Cables

MATERIALS/ADVANCED:

Same

APPLICATIONS OF TERMS:

Work Envelope
Relay Logic Controllers
Rotating Drum Controllers
Single-Board Controllers
Roll Degree
Disadvantages
Actuators
Accuracy
Payload
Repeatability
Automatic
Application
Robot
Controller
Drive Type
Travel
Drive
Axis
Table
Air Logic Controllers
Non-Intelligent Controllers
Optical Sensors
Geometric Motion Configurations
Sensors
Advantages
Resolution
Dynamic Performance
Load Capacity
Operational Speed
Automation
Artificial Intelligence
Robotic
Electronic Interface
Feed Rate
Mechanism
Reach
Height
Base

REFERENCES:

Bohn and MacDonald, et al., Power and Energy Technology, Mission Hills, CA: Glencoe/McGraw-Hill, 1991.

Coffron, James W., The Apple Connection, Berkeley, CA: Sybex, Inc., 2344 Sixth St., 1986.

Coffron, James W., The Commodore 64 Connection, Berkeley, CA: Sybex, Inc., 2344 Sixth St., 1986.

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Potter, Tony, How to Make Computer-Controlled Robots, Tulsa, OK: D. C. Publishing Co., 1987.

Schwaller, Anthony E., Transportation, Energy and Power Technology, Albany, NY: Delmar Publishers, Inc., 1989.

REFERENCE: 4.1

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Basic

MAJOR CONCEPT: Transportation is the movement of human and other cargo using vehicles such as buses, trucks, airplanes, railroad cars, and conveyors.

TOPICS:

1. Moving Passengers
2. Moving Cargo: Bulk or Break Bulk
3. Three Basic Users and Providers of Transport (personal, commercial, and governmental)
4. Modes of Transportation
5. Intermodal Transportation
6. On-Site Transportation

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Define transportation and how it affects society.
2. List the two main types of cargo (bulk and break bulk).
3. List the three groups providing transportation (personal, commercial, and governmental).
4. Identify five modes of transportation (highway, rail, air, water, pipeline, conveyor and elevator, etc.).
5. Explain intermodal transportation, and name examples of intermodal passenger and cargo transportation.
6. Define containerization and list advantages (saves labor, time, and cost).
7. Identify at least two on-site transportation devices used to move people (elevators, escalators, moving sidewalks, monorails, cableways, and automated guideway transit).

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss the meaning of transportation and its importance to our society.
2. Discuss the different types of passenger and cargo transportation systems.
3. Discuss the three types of users and providers of transportation.
4. Identify five modes of transportation.
5. Write a description or draw a picture of intermodal transportation vehicles in the area.
6. Construct a model transportation unit using various materials to run on a suspended string. (See Transportation Activity in Technology Activity Idea Book--ITEA.)

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Design a container for transporting a breakable object (egg, glass, etc.).
2. Construct a prototype of the container designed in Activity 1.
3. Test the prototype under various stress conditions.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
None

MATERIALS/CORE:

- Monofilament Fishing Line
- Paper Clips
- Clothespin
- Small Paper Bag
- Popsicle Stick
- Fishing Swivels
- Masking Tape
- Balloon(s)
- Soda Straw
- Strip of Aluminum Foil
- Pipe Cleaners
- Napkins

TOOLS AND EQUIPMENT/ADVANCED:
As Needed

MATERIALS/ADVANCED:
As Needed

APPLICATIONS OF TERMS:

- Transportation
- Freight
- Profit
- Intermodal Transportation
- Container Ships
- Monorail
- Break Bulk Cargo
- Terminals
- Control System
- Guidance System
- Power Transmission System
- Thrust
- Cargo
- Place Utility
- Modes
- Cranes
- Parcels
- Cable Way
- Vehicles
- Fleet
- Fixed Route
- Guideway
- Random Route
- Support/Cover System

REFERENCES:

Bohn and MacDonald, et al., Power and Energy Technology, Mission Hills, CA: Glencoe/McGraw-Hill, 1991.

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Goetsch, David L., and John A. Nelson, Technology and You, Albany, NY: Delmar Publishers, Inc., 1987.

Hacker, Michael, and Robert A. Barden, Technology in Your World, Albany, NY: Delmar Publishers, Inc., 1987.

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Schwaller, Anthony E., Transportation, Energy and Power Technology, Albany, NY: Delmar Publishers, Inc., 1989.

"Technology Activities," ITEA, Reston, VA, 1986.

REFERENCE: 4.2

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Principles of Transportation

MAJOR CONCEPT: Input, processes, and output are the key ingredients of a transportation system.

TOPICS:
1. Input (capital, working capital, stocks, fixed capital, people, and energy)
2. Processes (management processes, planning, organizing, controlling, production processes, and preparing to move)
3. Output (movement of passengers and cargo)
4. Government Controls on Transportation

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Describe the difference between fixed capital and working capital.
2. Explain regulation and deregulation.
3. Discuss the functions of three major types of management activities.
4. Identify the factors that are being controlled when operating vehicles.

CORE INSTRUCTIONAL ACTIVITIES:
1. Choose one method of transportation, and explain the three principles of it.
2. Plot a route from home to a given destination using several modes of transportation and a map.
3. Develop charts and diagrams to explain the school transportation systems.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Obtain transportation schedule for one of the passenger transportation modes. Plan a trip, using a U.S. map, to and from different destinations. Organize the plans in a step-by-step order.
2. Create a company that needs transportation to deliver its product. Determine the best way to ship the product depending on what is manufactured, the volume involved, delivery time, destination, and cost.

EVALUATION:
Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
None

MATERIALS/CORE:
Charts
Schedules
U.S. Maps

TOOLS AND EQUIPMENT/ADVANCED:
None

MATERIALS/ADVANCED:
None

APPLICATIONS OF TERMS:

Transportation System	Input
Capital	Management Processes
Output	Departure
Production Processes	Destination
Planning	Working Capital
Organizing	Moving
Vehicle Operation	En-Route Services
System Control	Completing the Move
Controlling System	Directing
Air Traffic Controllers	Reporting

REFERENCES:

Bohn and MacDonald, et al., Power and Energy Technology, Mission Hills, CA: Glencoe/McGraw-Hill, 1991.

Bohn, MacDonald, et al., Energy, Power and Transportation, Encino, CA: Bennett and McKnight Publishing Co., 1986. (to include instructor's resource guide)

Goetsch, David L., and John A. Nelson, Technology and You, Albany, NY: Delmar Publishers, Inc., 1987.

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Karwatka and Kozak, Energy, Power and Transportation, Orlando, FL: Harcourt, Brace, Jovanovich, Inc., 1987.

Schwaller, Anthony E., Transportation, Energy and Power Technology, Albany, NY: Delmar Publishers, Inc., 1989.

"Technology Activities," ITEA, Reston, VA, 1986.

REFERENCE: 5.1

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Highways

MAJOR CONCEPT: The movement of passengers and cargo over roads and highways is called highway transportation.

TOPICS:
1. Features and Benefits
2. Companies and Services
3. Highway Transport Vehicles
4. Physical Facilities
5. Regulating Agencies

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Define highway transportation, and tell how it affects our economy.
2. Identify factors that make highway transportation flexible (inter city-intra city).
3. Identify commercial freight companies, and give example.
4. Explain "owner-operator," and discuss the advantages and disadvantages of it.
5. Explain the advantages of tractor-trailer combinations as opposed to other forms of freight movement.
6. Describe two basic activities that occur in freight terminal (loading and unloading).
7. Identify several agencies responsible for governing or regulating transport systems, and discuss some of the regulations imposed by them.
8. Compare passenger service (cars and buses) with freight service (transfer trucks and delivery trucks).

CORE INSTRUCTIONAL ACTIVITIES:
1. Design a plan for getting to school on time and returning home in the afternoon using public transportation.
2. Trace the transportation of food from the farm to the school lunchroom.
3. Design models showing the history of highways.
4. Study and report on highway regulations using materials available from state agencies.
5. Discuss the economic impact of highway transportation in your community.
6. Compile a list of local freight companies using phone book or information from the local chamber of commerce.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Build and race a Metric 500 dragster.
2. Develop several mathematical examples of miles per gallon, percent tire tread wear, and oil consumption ratios. (This may work as a cross curriculum activity with the math department.)

3. Research one small aspect of the U.S. interstate highway system, and show how it is a vital link in our national economy. (Information on subjects such as planning, construction, laws, sizes, use, and services can be found at the local libraries and from the S. C. Department of Transportation.)

EVALUATION:
Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
None

MATERIALS/CORE:
S. C. Department of Transportation, P. O. Box 191, Columbia, SC 29202

TOOLS AND EQUIPMENT/ADVANCED:
As Needed (in the construction of the Metric 500 dragster)

MATERIALS/ADVANCED:
Metric 500 Kits
CO_2 Cartridges

APPLICATIONS OF TERMS:

Cab	Limited Access
Charter	Interchange
Kingpin	Motor Coaches
Transmission	Motor Freight Carriers

REFERENCES:

Bohn and MacDonald, et al., Power and Energy Technology, Mission Hills, CA: Glencoe/McGraw-Hill, 1991.

Bohn, MacDonald, et al., Energy, Power and Transportation, Encino, CA: Bennett and McKnight Publishing Co., 1986. (to include instructor's resource guide)

Goetsch, David L., and John A. Nelson, Technology and You, Albany, NY: Delmar Publishers, Inc., 1987.

Hacker, Michael, and Robert A. Barden, Technology in Your World, Albany, NY: Delmar Publishers, Inc., 1987.

Karwatka and Kozak, Energy, Power and Transportation, Orlando, FL: Harcourt, Brace, Jovanovich, Inc., 1987.

Schwaller, Anthony E., Transportation, Energy and Power Technology, Albany, NY: Delmar Publishers, Inc., 1989.

REFERENCE: 5.2

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Rail

MAJOR CONCEPT: Moving people and products in vehicles that run on rails is called rail transportation.

TOPICS:

1. Passenger Service
   - 1.1 AMTRACK
   - 1.2 Rapid transit
     - 1.2a elevated
     - 1.2b subway
     - 1.2c on grade
     - 1.2d regional
2. Freight Service
   - 2.1 Unit (same type of cargo to same destination, e.g., coal hauler or fruit express)
   - 2.2 Regular freight (variety of cargo and destination)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Describe and give examples of two categories of rail transportation (rapid transit and freight liners).
2. Explain rolling stock.
3. List and describe four types of railcars.
4. Describe what happens at a classification yard.

CORE INSTRUCTIONAL ACTIVITIES:

1. Simulate the transport of cargo/passengers from one destination to another using a model train system.
2. Role play workers in a classification yard.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Construct various types of railcars from cardboard (or appropriate materials), and discuss use of each.
2. Simulate scheduling, monitoring, and controlling systems used in the rail freight business. (Can use model train and truck to simulate selected activity)

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Model Train Set

MATERIALS/CORE:

None

TOOLS AND EQUIPMENT/ADVANCED:

Model Train Set
Model Truck

MATERIALS/ADVANCED:

As Needed

APPLICATIONS OF TERMS:

AMTRACK
Ballast
Gauge
Rapid Transit
Roadbed
Unit Trains
Dispatcher
Automatic Car Identification
Elevated Trains
On-Grade
Right-of-Way
Subways
Rolling Stock
Terminal

REFERENCES:

Bohn and MacDonald, et al., Power and Energy Technology, Mission Hills, CA: Glencoe/McGraw-Hill, 1991.

Bohn, MacDonald, et al., Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight Publishing Co., 1986. (to include instructor's guide)

Goetsch, David L., and Nelson, John A., Technology and You, Albany, NY: Delmar Publishers, Inc., 1987.

Hacker, Michael, and Robert A. Barden, Technology in Your World, Albany, NY: Delmar Publishers, Inc., 1987.

Karwatka and Kozak, Energy, Power and Transportation, Orlando, FL: Harcourt, Brace, Jovanovich, Inc., 1987.

Schwaller, Anthony E., Transportation, Energy and Power Technology, Albany, NY: Delmar Publishers, Inc., 1989.

REFERENCE: 5.3

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Air

MAJOR CONCEPT: Air transportation is the use of a vehicle to move passengers and cargo through the earth's atmosphere.

TOPICS:
1. History of Flight
2. Principles of Aircraft
3. Types of Aircraft
4. Air Transportation System
5. Regulatory Agencies
6. Career Opportunities

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Explain how an airplane flies using the terms lift, gravity, thrust, and drag.
2. Complete a time line showing the significant developments in aviation.
3. Give examples of the types of aircraft, and discuss their differences.
4. Explain basic power sources of aircraft.
5. Identify and discuss the functions of the parts of an aircraft.

CORE INSTRUCTIONAL ACTIVITIES:
1. Discuss the history of air transportation, air carriers, and aircraft.
2. Use a model or illustration to discuss principles of flight.
3. Discuss airport facilities, air carriers, airfreight, FAA, and the various associated career opportunities.
4. Collect various airline advertisements from local newspaper, and compare rates, times, and other information.
5. Construct and fly airplane models (U-control model, rubber-band power model, and/or a paper airplane--may require additional research).

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Write a three- to five-page research paper on a specific type of aircraft.
2. Test the flight stability of a balsa wood airplane. (See Activity #23, Energy, Power and Transportation Technology Activity Guide.)
3. Hold a "paper airplane" contest.
4. Experiment with various contoured balsa wing designs, and determine aerodynamic advantages and disadvantages of each (balsa for wings, fan for wind source, and spring scale for testing).
5. Construct a model rocket airplane, and launch it.

EVALUATION:
Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
As Needed

MATERIALS/CORE:
Model or Illustration on Principles of Flight
Current Newspapers
Materials Needed to Construct a Model Airplane

TOOLS AND EQUIPMENT/ADVANCED:
Spring or Postage Scale
Model Rocket Launch Kit
Motorized Fan

MATERIALS/ADVANCED:
Balsa Wood
Model Rocket Kit
Model Rocket Engine

APPLICATIONS OF TERMS:
Aircraft
Air Layers
Airport
Blimp
Charter Airlines
Domestic Airlines
Ground Vehicle
Jet Planes
Drag
Taxis
FAA
Thrust
Airframe
Airlines
Airspace
Baggage
Commuter Airline
General Aviation
Helicopters
Lift
Prop Planes
Tugs
Gravity

REFERENCES:

Bohn and MacDonald, et al., Power and Energy Technology, Mission Hills, CA: Glencoe/McGraw-Hill, 1991.

Bohn, MacDonald, et al., Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight Publishing Co., 1986. (to include instructor's guide)

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Hacker, Michael, and Robert A. Barden, Technology in Your World, Albany, NY: Delmar Publishers, Inc., 1987.

Karwatka and Kozak, Energy, Power and Transportation, Orlando, FL: Harcourt, Brace, Jovanovich, Inc., 1987.

Schwaller, Anthony E., Transportation, Energy and Power Technology, Albany, NY: Delmar Publishers, Inc., 1989.

REFERENCE: 5.4

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Water

MAJOR CONCEPT: Water transportation is the movement of cargo and passengers by vessels on water.

TOPICS:

1. Passenger and Cargo Transportation
2. Domestic and International Transportation
3. Water Transport Vessels
4. Physical Facilities
5. Transportation Routes
6. Types of Power Plants (e.g., steam, diesel, wind, turbo, air, and nuclear)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. List the two main types of water transportation services (barges and ships).
2. Define terms used in water transportation systems.
3. Explain why a general cargo ship is also called a break-bulk ship.
4. Locate on a map the inland waterways of the United States.
5. Explain why it is not economical for ships to stay in port very long.

CORE INSTRUCTIONAL ACTIVITIES:

1. Have student define and give examples of the following:
   - 1.1 Water transportation
   - 1.2 Liner service
   - 1.3 Sea lane
   - 1.4 Inland shipping
   - 1.5 Barge
   - 1.6 LASH (Lighter Aboard Ship)
2. Discuss the different ship configurations and how each is particularly suited for transporting passengers and/or cargo.
3. Explain the difference between tramp and liner service.
4. Explain the difference between containerships and break-bulk ships.
5. Locate and trace the inland waterway system using a map of the United States.
6. Discuss the importance of efficient terminals to a vessel.
7. List the main uses of the following vessels:
   - 7.1 Luxury liner
   - 7.2 Barge
   - 7.3 Tow boat
   - 7.4 Tugboat
   - 7.5 Lash
   - 7.6 Break-bulk ship
   - 7.7 Supertankers
   - 7.8 Containerships
   - 7.9 Submarines
   - 7.10 Seabee ships
   - 7.11 Alaska-hydro train
8. Build model barges, and float in a student-made canal.
9. Check model barges for buoyancy, draft, and volume.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Build a model of a canal with operational locks.
2. Build a working model airboat.

3. Conduct a concrete boat building contest to specifications provided by the teacher.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Large Water Container (split 6" PVC pipe)
Materials As Needed for Barge Construction
Materials As Needed to Make Various Model Small Boats
Fish Tank Pump
Small Model Boat
Springs
Valves
Sealants

MATERIALS/CORE:

Map of the United States
5 lb. Sand

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

6" Diameter PVC Pipe
Polyethylene Sheet
Silicon Sealing Caulk
Plexiglas
Tubing
Concrete

APPLICATIONS OF TERMS:

Barge
Containership
Deck
Hold
LASH
Liner Service
Seabee
Tanker
Tow
Tugboat
Break-Bulk Ship
Cruise Ship
Hatch
Inland Shipping
Lighter
Port
Sea-Lane
Terminal
Towboat
Vessel

REFERENCES:

Bohn and MacDonald, et al., Power and Energy Technology, Mission Hills, CA: Glencoe/McGraw-Hill, 1991.

Bohn, MacDonald, et al., Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight Publishing Co., 1986. (to include instructor's guide)

Hacker, Michael, and Robert A. Barden, Technology in Your World, Albany, NY: Delmar Publishers, Inc., 1987.

Karwatka and Kozak, Energy, Power and Transportation, Orlando, FL: Harcourt, Brace, Jovanovich, Inc., 1987.

Schwaller, Anthony E., Transportation, Energy and Power Technology, Albany, NY: Delmar Publishers, Inc., 1989.

REFERENCE: 5.5

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Pipeline

MAJOR CONCEPT: Pipeline transportation is the movement of cargo through a tube or pipe.

TOPICS:
1. Features and Benefits
2. Pipeline Types
3. Materials Transported Through Pipelines

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Define pipeline transportation.
2. List and explain four characteristics of pipelines: (1.) Cargo moves, vehicle stands still; (2.) Visually buried; (3.) Laid out in straight line to decrease travel time; and (4.) Theft difficult.
3. Explain how a pipeline can be shared by more than one shipper.
4. Identify the three basic types of pipeline (gathering, transmission, and distribution).
5. Explain how cargo is kept moving at a steady pace through the pipelines (pumps and control stations).
6. Name three types of products that are transported through the pipelines (gasoline, diesel, kerosene, coal and natural gas, wood chips, sulfur, and crude oil).
7. Identify materials that make pipelines (plastic or steel).
8. Explain methods used to prevent pipelines from clogging (e.g., cleaning brush called a pig).

CORE INSTRUCTIONAL ACTIVITIES:
1. Discuss the efficiency, advantages, and disadvantages of pipeline transportation compared with moving cargo by other modes.
2. Trace crude oil (using a map) as it travels from the fields of Alaska to the refineries on the West Coast.
3. Research companies in your area that transport cargo through pipelines, and find out how much they charge for their service. (Transportation cost is included in the rate charged to the customer.)
4. Construct a model pipeline using clear tubing and fittings, and move some colored water through it.

ADVANCED INSTRUCTIONAL ACTIVITIES:
Construct a model to illustrate the flow of gases, liquids, and solids. (Use clear plastic tubing, fittings, pumps, and syringes.)

EVALUATION:
Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
- Map of the United States
- Vacuum Cleaner

MATERIALS/CORE:
- Plastic Tubing
- Plastic Expandable Beads
- Tubing Clamps

TOOLS AND EQUIPMENT/ADVANCED:
- Aquarium Pump
- Vacuum Cleaner

MATERIALS/ADVANCED:
- Plastic Tubing
- Fittings
- Syringes
- Clamps

APPLICATIONS OF TERMS:
- Batch
- Control Station
- Measuring Station
- Transmission Pipeline
- Exchange Station
- Batch Sequence
- Mass
- Crossover Valves
- Distribution Pipeline
- Gathering Pipeline

REFERENCES:

Bohn and MacDonald, et al., Power and Energy Technology, Mission Hills, CA: Glencoe/McGraw-Hill, 1991.

Bohn, MacDonald, et al., Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight Publishing Co., 1986. (to include instructor's guide)

Karwatka and Kozak, Energy, Power and Transportation, Orlando, FL: Harcourt, Brace, Jovanovich, Inc., 1987.

Schwaller, Anthony E., Transportation, Energy and Power Technology, Albany, NY: Delmar Publishers, Inc., 1989.

REFERENCE: 6.1

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Engines

MAJOR CONCEPT: External combustion engines use heat energy and expanding gases produced outside the engine.

TOPICS:

1. History and Development of External Combustion Engines
2. Types of Motion Produced by Heat Engines (reciprocating, rotary, and linear)
3. Type of External Combustion Engines and How They Operate (steam reciprocating, steam turbine, and Stirling cycle)
4. Power Theory and Efficiency

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Prepare a simple time line illustrating the development of the external combustion engines.
2. Match each type to external combustion engine with a diagram illustrating it, and tell the type of motion it produces.
3. Calculate pressure/force problems using Force = Pressure X Area.
4. List reasons for loss of efficiency and ways to minimize losses.
5. Operate a model steam engine, and discuss the principles involved.

CORE INSTRUCTIONAL ACTIVITIES:

1. Make models and discuss the operation of the following:
   - 1.1 Uniflow steam engine
   - 1.2 Reaction turbine
   - 1.3 Impulse turbine
2. Research and report, in two groups, on the development of steam power and how it has affected the history of the world.
3. Bring in pictures illustrating uses of external combustion engines, and make a bulletin board from the pictures.
4. Explain and discuss the principles of operation and application for the Stirling cycle engine.
5. Work several example problems on calculating force, and discuss how force can be increased or decreased in an external combustion engine.

ADVANCED INSTRUCTIONAL ACTIVITIES:

Construct a steam turbine (impulse or reaction).

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
Model Steam Engine
Cylinder Tank Burner

MATERIALS/CORE:
Copper Tubing
Various Fittings

TOOLS AND EQUIPMENT/ADVANCED:
None

MATERIALS/ADVANCED:
None

APPLICATIONS OF TERMS:

Reciprocating	Rotary
Linear	Condense
Reaction	Impulse
Expansion	Compression
Captive	Regenerator
Piston	Multifuel
Cylinder	Stirling

REFERENCES:

Bohn and MacDonald, et al., Power and Energy Technology, Mission Hills, CA: Glencoe/McGraw-Hill, 1991.

Bohn, MacDonald, et al., Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight Publishing Co., 1986. (to include instructor's guide)

Karwatka and Kozak, Energy, Power and Transportation, Orlando, FL: Harcourt, Brace, Jovanovich, Inc., 1987.

Schwaller, Anthony E., Transportation, Energy and Power Technology, Albany, NY: Delmar Publishers, Inc., 1989.

REFERENCE: 6.2

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Internal Combustion Engine

MAJOR CONCEPT: Internal combustion engines are engines in which the heat and pressure are produced inside the engine.

TOPICS:

1. Spark Ignition (S.I.)
2. Compression Ignition (C.I.)
3. Rocket Engine
4. Jet Engine

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Demonstrate how an internal combustion engine produces motion from burning fuel.
2. Demonstrate and explain what happens during each of the four strokes of a four-stroke engine.
3. Demonstrate and explain the operation of a two-stroke engine.
4. Identify advantages and disadvantages of the two-stroke engine as compared to the four-stroke engine.
5. Describe the primary differences between diesel and gasoline engines.
6. Explain how a diesel-electric engine combination operates.
7. Describe the operation of the Wankel/rotary engine in terms of the four-stroke engine.
8. State Newton's third law of motion, and explain how it is used in jet and rocket propulsion.
9. Explain how turbojet, ramjet, turbofan, and turboprop engines work.

CORE INSTRUCTIONAL ACTIVITIES:

1. Show and explain the strokes of a two- and a four-cycle engine using a cutaway model.
2. Describe the difference between the operation of a gasoline and a diesel engine using illustrations, models, and charts.
3. Explain Newton's third law of motion and how it applies to jet propulsion.
4. Demonstrate the direct motion of a Wankel engine using a wheel.
5. Construct and launch a single stage model rocket.

ADVANCED INSTRUCTIONAL ACTIVITIES:

Construct and launch a multistage model rocket.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Model of a 4-Cycle Engine
Model of a 2-Cycle Engine
Model or Illustration of a Gasoline Engine
Model or Illustration of a Diesel Engine
Model or Illustration of a Wankel Engine
Launching Pad
Wheel (4" Wagon Type)

MATERIALS/CORE:

Variety of Rocket Engines
Rocket Kits
Corks
Balsa Wood
Rocket Wadding
Balloons
Tape
Solar Igniters

TOOLS AND EQUIPMENT/ADVANCED:

Launching Pad
Solar Igniters

MATERIALS/ADVANCED:

Variety of Rocket Engines
Rocket Kits
Tape
Rocket Wadding
Corks
Balsa Wood

APPLICATIONS OF TERMS:

Piston
Diesel Engine
Wankel Engine
Turbojet Engine
Turbofan Engine
Ramjet Engine
Internal Combustion
Cycle
Power Stroke
Otto Cycle
Ports
Rotor
Turbine
Combustion Chambers
Stroke
Gasoline Engine
Jet Engine
Turbine Engine
Rocket Engine
Thrust
Combustion
Intake Stroke
Compression Stroke
Exhaust Stroke
Crankcase
Compression Ignition
Locomotives

REFERENCES:

Bohn and MacDonald, et al., Power and Energy Technology, Mission Hills, CA: Glencoe/McGraw-Hill, 1991.

Bohn, MacDonald, et al., Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight Publishing Co., 1986. (to include instructor's guide)

Estes Industries, P.O. Box 227, Penrose, CO 81204.

Karwatka and Kozak, Energy, Power and Transportation, Orlando, FL: Harcourt, Brace, Jovanovich, Inc., 1987.

Schwaller, Anthony E., Transportation, Energy and Power Technology, Albany, NY: Delmar Publishers, Inc., 1989.

REFERENCE: 6.3

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Automotive Engines

MAJOR CONCEPT: There are over 100 million internal combustion automotive engines in the United States.

TOPICS:

1. Classification of Engines (number of cylinders, cylinder arrangement, type of valve system, type of fuel used, and type of cooling system)
2. Types of Engine Systems
   - 2.1 Mechanical systems
   - 2.2 Cooling systems
   - 2.3 Lubricating systems
   - 2.4 Fuel systems
   - 2.5 Exhaust systems
   - 2.6 Ignition systems
   - 2.7 Computer control systems

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Name and describe the systems of an automobile engine (mechanical, cooling, lubricating, fuel, exhaust, and ignition).
2. Describe how engines are classified.
3. Identify engine operating characteristics that can be computer controlled.
4. Identify and describe characteristics of alternative fuels.
5. Describe principal operating differences between fuel-injection and carburetion.
6. Perform basic tune-up procedures on an automobile engine.
7. Identify basic components of an automobile system.
8. Devise a checklist for preventive maintenance.

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss the advantages and disadvantages of a gasoline, diesel, and rotary powered engine.
2. List and discuss alternative fuels found in your community.
3. Identify and discuss systems that can be controlled by a computer.
4. Explain the difference between fuel injection systems and carburetor systems.
5. Demonstrate the basic tune-up procedures for an automobile. (Differentiate between gasoline and diesel)
6. List all necessary information needed to tune up the family car using a tune-up guide.
7. Lead a discussion on factors which affect gas mileage (e.g., aerodynamics, tires, acceleration, deceleration, etc.).

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Perform a complete tune-up on an automobile engine.
2. Write a five- to six-page research paper on the history of the automobile and its technological advantages.
3. Perform an oil and filter change on an automotive engine.

EVALUATION:
Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
Model or Illustration of a Gasoline Engine
Model or Illustration of a Diesel Engine
Model or Illustration of a Rotary Engine
Automotive Tune-Up Kit (according to state equipment list)
Timing Light
Dwell Meter

MATERIALS/CORE:

Spark Plugs	Condenser
Ignition Points	Solid State Ignition

TOOLS AND EQUIPMENT/ADVANCED:
Automotive Tune-Up Kit (according to state equipment list)
Oil Filter Wrench

MATERIALS/ADVANCED:

Same	Motor Oil

APPLICATIONS OF TERMS:

Glow Plug	Methanol
Gasohol	Diesel
Compression Ration	Cylinder
Alternator	Ignition Coil
Fuel-Injection Pump	Carburetor
Camshaft	Flywheel
Starter	Motor
Sensors	Timing
Ignition	Rotor Cap
Electrodes	Condenser
Ground	Distributor
Choke	Idle Screw
Fuel Pump	Air Cool
Oil Pump	Piston
Valve	Four-Stroke

REFERENCES:

Bohn and MacDonald, et al., Power and Energy Technology, Mission Hills, CA: Glencoe/McGraw-Hill, 1991.

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Schwaller, Anthony E., Transportation, Energy and Power Technology, Albany, NY: Delmar Publishers, Inc., 1989.

REFERENCE: 6.4

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Small Internal Combustion Engines

MAJOR CONCEPT: A small engine is generally a one cylinder, air cooled, two- or four-stroke piston engine producing up to eight horse power and used on lawn mowers, portable generators, rototillers, etc.

TOPICS:
1. Primary Mechanical Parts of a Small Engine
2. Operation-Theory
3. Safety
4. Maintenance

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Identify and describe six major systems of the small engine (mechanical, lubrication, cooling, fuel, ignition/starting, and exhaust).
2. Identify and describe the function of each of the main parts of the mechanical system including the crankcase, cylinder head, piston rings, connecting rod crankshaft, intake and exhaust valves, valve springs, and timing gears.
3. List four ways the lubrication system serves the engine.
4. Identify procedures necessary to protect an engine during short- or long-term storage.
5. Troubleshoot a malfunctioning engine.
6. Identify three conditions an engine requires for good operation (ignition, fuel, and compression), and describe how to check each condition.
7. Complete a safety test on small engines.
8. Disassemble and reassemble a small engine.
9. Convert a conventional small engine to solid state ignition.
10. Adjust carburetor and governor to manual specifications.
11. Identify basic small engine repair tools.
12. Perform a tune-up on a conventional engine.

CORE INSTRUCTIONAL ACTIVITIES:
1. Troubleshoot a small engine, and identify parts necessary to make a repair using a service manual and tools.
2. Using an owner's manual, follow the manufacturer's recommendations for preseason/postseason maintenance on a lawn mower engine.
3. Perform a tune-up on a small engine.
4. Take a two-stroke cycle and four-stroke cycle, and explain the theory of operation for each (using a chart).
5. Name the components of a given small engine.
6. List and describe the functions of each of the major systems of a small engine.
7. Describe how lubrication cleans, seals, lubricates, and cools a small engine.
8. Identify and describe the function of a crankcase, cylinder, cylinder head piston rings, connecting rods, crankshaft, intake valve/parts, exhaust valve/parts, valve springs, and timing gears.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Disassemble and reassemble a small engine (leave carburetor together and piston in place).
2. Observe a teacher demonstration on converting a conventional small engine to solid-state ignition.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Basic Small Engine Tool Kit
1/4" Socket Wrench Set
Easy-Out Set
Large, Curved Jaw Pliers
Magnetron Ignition Tool
Wire Feeler Gauge
Point File
Funnel
Wall Mount Blade Balancer
Long Allen Wrench Set
Torque Wrench
Tap and Die Set
Adjustable Wrench Set
Seal Puller
Condenser Tool
Flat Feeler Gauge
Gasoline Can
Large 3-Jaw Gear Puller
Nut Driver Set
Oil Drain Pan

MATERIALS/CORE:

Motor Oil
Solvent
Hand Cleaner
Starting Fluid

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Same

APPLICATIONS OF TERMS:

Timing Mark
Intake Valves/Parts
Two-Stroke Cycle
Camshaft
Charging System
Crankshaft
Cylinder Head
Fuel Injection
Valve Springs
Air Vane
Connecting Rods
Piston Rods
Lobes
Piston
Spark Plug
Valve
Mechanical Systems
Exhaust/Parts
Four-Stroke Cycle
Cam
Carburetor
Cooling System
Cylinder Block
Electrical System
Fuel Pump
Mechanical Governor
Torque Wrench
Crankcase
Seal
Fuel System
Power Train
Starting System
Valve Train
Lubrication Systems

REFERENCES:

Bohn and MacDonald, et al., Power and Energy Technology, Mission Hills, CA: Glencoe/McGraw-Hill, 1991.

Bohn, MacDonald, et al., Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight Publishing Co., 1986. (to include instructor's guide)

Karwatka and Kozak, Energy, Power and Transportation, Orlando, FL: Harcourt, Brace, Jovanovich, Inc., 1987.

Schwaller, Anthony E., Transportation, Energy and Power Technology, Albany, NY: Delmar Publishers, Inc., 1989.

Stephenson, George, Small Gasoline Engines, Albany, NY: Delmar Publishers, Inc., 1984.

REFERENCE: 7.1

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Solar

MAJOR CONCEPT: Solar energy is energy received by the earth from the sun; it provides, directly or indirectly, all of the sources of energy for the earth.

TOPICS:

1. Heating With Solar Energy
2. Electricity From Solar Energy

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Explain how solar energy is used to provide heat and electricity.
2. Describe how heat is moved by conduction, radiation, and convection.
3. Differentiate between a good insulator and a good conductor of heat energy.
4. Explain the difference between passive and active solar heating.
5. Explain the operation of passive and solar heating systems.
6. Explain the principle of thermo-siphoning.
7. Explain the operation of an active solar heating system including the operation of the collector, the heat storage unit, the distribution system, and the controls.
8. Describe how photovoltaic cells convert solar energy to electricity.
9. Identify two systems that might someday be used to capture solar energy in outer space for use on earth. (SOLARES--Space-Orbiting Light-Augmentation Reflector Energy System and SPS--Solar-Powered Satellites)

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss the advantages and disadvantages of passive versus active solar systems.
2. Demonstrate the principle of thermo-siphoning.
3. Define photovoltaic cell, and discuss its importance in the production of electricity.
4. Discuss the future applications of solar energy in outer space.
5. Experiment with various materials to determine whether they are good insulators or conductors of heat.
6. Construct a solar heat collector, and discuss the operation of an active solar heating system. (Heat collector employing a heat exchanger)
7. Construct a solar battery. (See reference)
8. Construct and use a sun target. (See reference)
9. Construct a mirrored dish collector with focal point for roasting hot dogs or measuring temperature.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Construct and experiment with model solar projects such as solar-powered cars, boats, and other motorized projects.
2. Build a solar water purification system.
3. Use solar trainer to conduct various experiments.

EVALUATION:
Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
PVC Pipe and Fittings
Solar Collector
Thermometer
Aluminum Flashing
Fan
Storage Tanks
Insulating Materials
Mirrored Dish
Photovoltaic Cells

MATERIALS/CORE:
Aluminum Can and Sheets
See Activity Guide

TOOLS AND EQUIPMENT/ADVANCED:
Solar Experimenter Kits
Wheels
Axles
Solar Cells
Gears
Solar Trainer

MATERIALS/ADVANCED:
None

APPLICATIONS OF TERMS:
Conduction
Radiation
Heat Loss
Passive Systems
Thermal Collector
Indirect-Gain
Thermo-Siphoning
Solar Panel
Frame
Insulation
Tubing
Transparent
Backup (Heating System)
Radiant Heaters
Photovoltaic System
Cogeneration
Orbiting Mirrors
Energy System
Light Augmentation Reflector
Convection
Convection Current
Active Systems
Direct-Gain
Overhand
Thermal Loss
Solar Collector
Greenhouse Effect
Density
Heat Absorber
Glazing
Translucent
Heat Exchanger
Changeover Valve
Photons
Heat Pump
SOLARES/Space-Orbiting
Microwaves
Solar Sailing

REFERENCES:
Bohn and MacDonald, et al., Power and Energy Technology, Mission Hills, CA: Glencoe/McGraw-Hill, 1991.

Bohn, MacDonald, et al., Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight Publishing Co., 1986. (to include instructor's guide)

REFERENCES continued:

Karwatka and Kozak, Energy, Power and Transportation, Orlando, FL: Harcourt, Brace, Jovanovich, Inc., 1987.

Schwaller, Anthony E., Transportation, Energy and Power Technology, Albany, NY: Delmar Publishers, Inc., 1989.

REFERENCE: 7.2

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Nuclear

MAJOR CONCEPT: Nuclear energy is the energy released when matter is changed into energy.

TOPICS:

1. Origin and Use of Nuclear Power
   1.1 The atom (atomic structure)
2. Nuclear Reaction
   2.1 Nuclear fission
   2.2 Nuclear fusion
3. Nuclear Auxiliary Power
4. Impact on Environment

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Explain the origins and physical characteristics of nuclear energy and how it is used in our lives.
2. Explain the two types of nuclear reactions.
3. Classify and compare the uses of the nuclear auxiliary power devices.
4. Explain how a nuclear power plant creates electricity from atomic energy.

CORE INSTRUCTIONAL ACTIVITIES:

1. Construct a collage showing various uses of nuclear power, and draw the structure of an atom.
2. Draw a diagram of what occurs during each type of nuclear reaction. Show sequences of occurrences and physical properties/facilities (i.e., fuels, nuclear plants, reactors, etc.).
3. Discuss the types of nuclear auxiliary power, and explain their benefits. Compare the advantages and disadvantages of each (nuclear battery, thermoelectric, and coupling).
4. Discuss the hazards of nuclear power.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Construct a model of a nuclear reactor.
2. Demonstrate the primary and secondary system used in a nuclear reactor using the solar collector constructed in 7.1.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

None

MATERIALS/CORE:

Current Magazine Articles

TOOLS AND EQUIPMENT/ADVANCED:
As Needed (to construct a model solar collector)

MATERIALS/ADVANCED:
As Needed (according to model design)

APPLICATIONS OF TERMS:

Fission	Fusion
Plutonium	Pellet
Deuterium Oxide	Uranium
Radiation	Reactor
Fuel Rods	Heat Exchanger
Nuclear Wastes	Tritium
Fusion Reaction	Lithium
Plasma	Tokamak
Laser	Beta Particle
Thermocouple	Helium
Isotopes	Nucleus
Megawatts	Nuclear Battery
Nuclear Plant	Core
Nuclear Fusion	Pressurized-Water Reactors

REFERENCES:

Bohn and MacDonald, et al., Power and Energy Technology, Mission Hills, CA: Glencoe/McGraw-Hill, 1991.

Bohn, MacDonald, et al., Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight Publishing Co., 1986.

Karwatka and Kozak, Energy, Power and Transportation, Orlando, FL: Harcourt, Brace, Jovanovich, Inc., 1987.

Schwaller, Anthony E., Transportation, Energy and Power Technology, Albany, NY: Delmar Publishers, Inc., 1989.

REFERENCE: 7.3

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Space Exploration

MAJOR CONCEPT: Space can be explored due to our technical knowledge of space vehicles and propulsion systems.

TOPICS:

1. Types of Space Vehicles
2. Types of Propulsion Systems
3. Applications of Space Vehicles and Propulsion Systems
4. Impact on Society and Environment

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Recognize the types of power sources, propulsion control, and guidance systems used in spacecrafts.
2. Discuss the role that space shuttles have in transporting people and products into space.
3. Identify contributions that space exploration has made and will make in the technologies of production, communication, and energy utilization; and identify the impact of these upon society and the environment.
4. Identify the various manned and unmanned spacecraft and their uses throughout the history of space flight.
5. Demonstrate imagination and creativity concerning the future of space travel and colonization through written assignments, designing, and model building.
6. Demonstrate proper safety precautions in working with model rockets.

CORE INSTRUCTIONAL ACTIVITIES:

1. Design and build a model spacecraft to be powered by a purchased engine.
2. Test stability of a model rocket by using a string to simulate flying. (Use rockets constructed in 6.2.)
3. Make a time line of spacecrafts showing the name, date, and use of each; and display it in the school.
4. Design a space station/colony, spacecraft, and/or satellite model.
5. Identify reasons for the use of manned and unmanned spacecraft throughout class period.
6. Discuss possible uses for space shuttles in space exploration.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Experiment with various sizes of rocket engines to determine thrust. (Use a holding fixture and weight scale. Record the thrust in pounds.)
2. Construct very small models of satellites, and attach to a globe to represent a geosynchronous orbit.
3. Launch a multistage model rocket with a payload (camera equipped rocket).

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

As Needed (in construction of model spacecraft)
Launchpad
Ignition System

MATERIALS/CORE:

As Needed (for construction of model spacecraft)

TOOLS AND EQUIPMENT/ADVANCED:

As Needed (for construction of model spacecraft)

Launchpad	Ignition System
Payload	Globe

MATERIALS/ADVANCED:

Same

APPLICATIONS OF TERMS:

Gyrostabilizers	Velocity
Transporter	Fuel
Orbiter	Lander
Space Travel	Sensing
Meteorological	Combustion
Multistaging	Satellites
Orbit	Synchronous Orbit
Oxidizer	Space Mirrors
Propellants	Microwaves
Sputnik	Mining
Space Staging	Radar
Robot	Voyager
Defense	Geological
Launch	Propulsion

REFERENCES:

See additional references attached.

REFERENCE: 7.4

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Emerging Systems

MAJOR CONCEPT: Technology and transportation systems are ever changing and improving to meet the demands of society.

TOPICS:
1. Advancing Technology (lasers, cryogenics, fuel cells, composite materials, and superconductors)
2. Advanced Utilization of Energy Sources
3. Advances in Transportation (Rail, Highway, Air, Space, and Water)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Define and explain uses of cryogenics, laser, fuel cell, composite materials, and superconductors.
2. Identify and recognize emerging technologies.
3. Identify and recognize emerging improvements in the transportation systems.

CORE INSTRUCTIONAL ACTIVITIES:
1. Design a "perpetual motion machine " Compete with class members to see who can make theirs run the longest.
2. Bring in articles for advancing technologies to share with the class.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Conduct experiments using the laser trainer as specified in the state equipment list.
2. Construct a magnetic levitation train. (Activity No. 11--Activity Guide)
3. Write a report on how technology and transportation will "affect my life in the future."
4. Heat various materials of the same mass for a predetermined time, and record temperatures (wood, plastic, or water, using a microwave oven and a thermometer).

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

None

MATERIALS/CORE:

None

TOOLS AND EQUIPMENT/ADVANCED:

Laser Trainer (as specified in the state equipment list)
Microwave Oven
Thermometer

MATERIALS/ADVANCED:
None

APPLICATIONS OF TERMS:

- Fiber Optics
- Holography
- Ruby Laser
- Levitate
- Oxidizer
- Superconductor
- Fuel Cells
- Laser
- Electrolyte
- Hydrogen
- Fuel

REFERENCES:

Bohn and MacDonald, et al., Power and Energy Technology, Mission Hills, CA: Glencoe/McGraw-Hill, 1991.

Bohn, MacDonald, et al., Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight Publishing Co., 1986. (including activity guide)

Karwatka and Kozak, Energy, Power and Transportation, Orlando, FL: Harcourt, Brace, Jovanovich, Inc., 1987.

Schwaller, Anthony E., Transportation, Energy and Power Technology, Albany, NY: Delmar Publishers, Inc., 1989.

REFERENCE: 8.1

MAJOR TITLE: Energy, Power and Transportation Technology

UNIT TITLE: Careers in Power/Transportation

MAJOR CONCEPT: Exciting careers await you in power and transportation services, manufacturing, and research.

TOPICS:

1. Career Types (production, mechanic, technician, technologist, engineer, etc.)
2. Choosing a Career in Power/Transportation
3. Sources of Career Information (Occupational Outlook Handbook and SCOIS)
4. Individual Career Needs (abilities, interests, and value of oneself and education)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Discuss how knowledge of one's interests, aptitudes, and abilities is important when choosing a career.
2. Identify a variety of places where information about careers can be obtained.
3. Identify and describe five common career areas (production, mechanic, technician, technologist, and engineer).
4. Develop a training plan to meet the entry-level requirements for a chosen career.

CORE INSTRUCTIONAL ACTIVITIES:

1. Take interest inventory and manual battery test, and find out about available careers when guidance counselor visits.
2. Define five common career areas in the field of power and transportation.
3. Compare test results from #1 above with job requirements of a particular career.
4. Use South Carolina Occupational Information System (SCOIS) to get information on careers.
5. Go through the career choice steps (self-analysis and knowledge of careers).

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Write a report concerning a particular power/transportation career.
2. Interview people from various occupations in the power/technology area.
3. Map the educational path to obtaining a job in the following power/transportation fields: truck driver, heating and air-conditioning specialist, electrician, vehicle designer, and energy researcher.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
Computer
SCOIS Access

MATERIALS/CORE:
Trade and Technical Careers Handbook

TOOLS AND EQUIPMENT/ADVANCED:
None

MATERIALS/ADVANCED:
None

APPLICATIONS OF TERMS:
None

REFERENCES:

Bohn and MacDonald, et al., Power and Energy Technology, Mission Hills, CA: Glencoe/McGraw-Hill, 1991.

Bohn, MacDonald, et al., Energy, Power and Transportation Technology, Encino, CA: Bennett and McKnight Publishing Co., 1986.

Career Center Course Descriptions.

South Carolina Department of Transportation, P. O. Box 191, Columbia, SC 29202.

Junior and Senior Level College Catalogs.

Karwatka and Kozak, Energy, Power and Transportation, Orlando, FL: Harcourt, Brace, Jovanovich, Inc., 1987.

Schwaller, Anthony E., Transportation, Energy and Power Technology, Albany, NY: Delmar Publishers, Inc., 1989.

Manufacturing

Technology

MANUFACTURING TECHNOLOGY
RECOMMENDED INSTRUCTIONAL TIME

		9 WKS	18 WKS	36 WKS
1.	Management			
1.1	Manufactured Products	1	1	2
1.2	The Manufacturing Enterprise	1	1	1
1.3	The Manufacturing System	1	2	5
1.4	Incorporating a Business	1	1	2
1.5	Developing a Management Structure	1	1	2
1.6	Design-Analysis Method		1	1
1.7	Product Design	1	4	7
1.8	Research and Development	1	1	2
1.9	Product Engineering	1	4	8
2.	Management and Personnel			
2.1	Establishing Accident Prevention Programs	2	3	6
2.2	Hiring		1	2
2.3	Training	1	1	2
2.4	Organized Labor and Collective Bargaining		1	1
3.	Management and Production			
3.1	Extracting Raw Materials	2	3	3
3.2	Making Basic Materials		1	2
3.3	Separation by Chip Removal	1	3	12
3.4	Shearing	1	5	10
3.5	Separation by Other Processes	2	5	12
3.6	Casting and Molding	2	6	10
3.7	Forming	2	5	10
3.8	Conditioning	1	5	10
3.9	Combining	2	5	10
3.10	Coating	1	5	10
3.11	Production Management	2	2	5
3.12	Tooling Up for Production	5	5	12
3.13	Inventory Control	1	2	5
3.14	Quality Control	2	3	6
3.15	Producing the Product	4	5	5
3.16	Packaging	3	4	8
4.	Management			
4.1	Maintaining and Servicing Products	1	2	6
4.2	Marketing and Distribution	1	1	2
4.3	Liquidating a Company	1	1	1
	TOTAL HOURS	45	90	180

REFERENCE: 1.1

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Manufactured Products

MAJOR CONCEPT: Manufacturing provides us with products, produced in a plant, that make our lives easier.

TOPICS:

1. Evolution of Manufacturing
2. Manufacturing and Nonmanufacturing
3. Importance of Manufactured Goods in Our Society
4. Durable and Nondurable Goods
5. How Products Are Manufactured
6. Impact of New Technologies on Manufacturing
7. Orientation to This Study in Manufacturing

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Trace the evolution of manufacturing by explaining events that advanced the technology used in manufacturing.
2. Differentiate between manufactured and nonmanufactured goods.
3. Compare and contrast society's use of manufactured and nonmanufactured goods.
4. Identify manufactured durable and nondurable goods.
5. Discuss how manufactured products are made.
6. Participate in group research of a recent process development in manufacturing technology.
7. Describe what will be learned about manufacturing in this course.

CORE INSTRUCTIONAL ACTIVITIES:

1. Produce an illustrated time line that traces the historical development of a manufactured product.
2. Discuss manufactured/nonmanufactured goods and durable/nondurable goods provided by the instructor.
3. Describe in a short paper what life was like one hundred years ago.
4. Prepare a display of group research on a recent process development in manufacturing technology.
5. Participate in a discussion on what will be learned about manufacturing in this course.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Identify an example of durable goods, and discuss design changes that would make the product more futuristic.
2. Prepare a display of research on a recent process development in manufacturing technology.
3. Discuss the technologies essential to the development of selected recent processes.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
Art Supplies (scissors, brushes, and markers)

MATERIALS/CORE:

Magazines	Paper
Tape	Glue
Art Supplies	

TOOLS AND EQUIPMENT/ADVANCED:
Same

MATERIALS/ADVANCED:
Same

APPLICATIONS OF TERMS:

Durable Goods	Nondurable Goods
Product	Technology
Nonmanufactured	Product Evolution
Manufacturing Technology	

REFERENCES:

Fales, James, et al., Manufacturing: A Basic Text, Columbus, OH: Glencoe Publishing Co., 1986.

Groneman, C. H., and G. E. Grannis, Exploring the Industries, Albany, NY: Delmar Publishers, 1981.

Wright, R. Thomas, Exploring Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

REFERENCE: 1.2

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: The Manufacturing Enterprise

MAJOR CONCEPT: There are three major types of manufacturing organizations: proprietorships, partnerships, and corporations.

TOPICS:
1. Reasons for Starting a Manufacturing Enterprise
2. Proprietorships
3. Partnerships
4. Corporations
5. Advantages and Disadvantages of Each

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Explain why manufacturing enterprises are formed.
2. List the duties and responsibilities of proprietors and partners.
3. Explain why a corporation can usually expand faster than a proprietorship or partnership.
4. List advantages and disadvantages for each kind of manufacturing enterprise.
5. Identify the elements that distinguish a corporation from other forms of organization.

CORE INSTRUCTIONAL ACTIVITIES:
1. Select the duties and responsibilities of a proprietor, a partner, and a stockholder, using a master list after participating in class discussion.
2. Divide the duties and responsibilities into advantages and disadvantages.
3. Participate in a class vote of the preferred type of enterprise for selected products, and explain in a paragraph why a particular enterprise was selected for a particular product.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Draw an organizational chart for a corporation, and assign personnel to each position.
2. Participate in class election of a Board of Directors.

EVALUATION:
Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
None

MATERIALS/CORE:
Handout (master list of duties and responsibilities) See Reference

TOOLS AND EQUIPMENT/ADVANCED:
None

MATERIALS/ADVANCED:
Poster Board
Ballots
Markers

APPLICATIONS OF TERMS:

Proprietorship	Partnership
Corporation	Board of Directors
Officers	Job Duties
Organization Chart	Capital
Stock	

REFERENCES:

Daiber, Robert A., and Thomas L. Erekson, Manufacturing Technology: Today and Tomorrow, Columbus, OH: Glencoe Publishing Co., 1991.

Fales, James, et al., Manufacturing: A Basic Text, Columbus, OH: Glencoe Publishing Co., 1986.

Wright, R. Thomas, Manufacturing Systems, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

REFERENCE: 1.3

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: The Manufacturing System

MAJOR CONCEPT: All systems, including the manufacturing system, are made up of three parts: inputs, processes, and outputs. Systems enable companies to reach goals.

TOPICS:

1. Types of Systems (e.g., digestive, railway, filing, and production)
2. Relationship of System and Efficiency
3. The Six Inputs to Manufacturing (natural resources, human resources, capital, knowledge, finance, and energy)
4. Manufacturing Technologies (production technology, management technology, and personnel technology)
5. Manufacturing Outputs (consumer products, industrial products, military products, and other outputs)
6. Manufacturing Goals (company's goals and society's goals)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify the inputs, processes, and outputs in relation to common types of systems.
2. Identify the inputs, processes, outputs, and goals in relation to manufacturing systems.
3. Identify and discuss the six inputs to manufacturing.
4. Describe sources of the inputs to manufacturing.
5. Calculate the necessary inputs to produce a collated paper product.
6. Describe what is involved in production technology, management technology, and personnel technology.
7. Categorize products according to the end user type.
8. Produce a recycled product (i.e., paper).
9. Describe how manufacturing can positively and negatively affect society.
10. Explain what happens when manufacturing companies do not make a profit.
11. Identify some of the inputs, processes, and outputs of future class laboratory activities.

CORE INSTRUCTIONAL ACTIVITIES:

1. Identify, working in groups, a system other than manufacturing, and prepare a chart showing the three parts of that system.
2. Identify, working in groups, a type of manufacturing industry, and prepare a chart showing elements in the three parts of that industry's manufacturing system.
3. List and describe the six inputs to manufacturing.
4. Categorize a given list of resources into the six types of inputs.
5. Determine and calculate the inputs needed to produce a specific number of collated paper products.
6. Produce a collated paper product such as a set of handouts, booklets, or tests.

7. Discuss the practices involved in production technology, management technology, and personnel technology.
8. Write a description of the duties of a worker employed in either the management or the production part of manufacturing (after conducting an interview with an acquaintance).
9. Participate in role-playing interviews for selected positions in a manufacturing company.
10. Categorize a teacher-provided list of products according to the end user.
11. Recycle used paper products to produce a usable sheet of paper.
12. Make fire starter strips from sawdust, glue, and wax paper.
13. Discuss profit and how manufacturing companies use profits.
14. Write a paragraph to describe how unemployment affects society.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Invent an idea for a product, and prepare a chart illustrating the elements required in the system for producing that product.
2. Create a computerized spreadsheet showing the inputs used in producing the product in Activity 6.
3. Participate in videotaped role-playing interviews for selected positions in a manufacturing company.
4. Bring scrap material to class, and recycle it to produce a usable product (aluminum scrap to make ingot and lead scrap to make fishing weights).
5. Contact a local industry to determine what is done with the waste materials.
6. Clip news articles pertaining to hazardous waste management.
7. Participate in a class collection of used aluminum products that will be sold to an aluminum recycling plant.
8. Use course catalogs from local institutions of higher learning to determine what courses are offered in high tech industrial training and retraining.
9. Contact the local chamber of commerce to find out how new industry is attracted to the area, and present the information to the class.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Selected Product Examples
Stapler
Paper Making Equipment (see reference)
Markers
Spirit Duplicator

MATERIALS/CORE:

Construction Paper
Scrap Paper
Handout (list of resources: see reference)
Handout (product list: see reference)
Materials for Paper Recycling (see reference)
Spirit Masters

TOOLS AND EQUIPMENT/ADVANCED:

Computer and Spreadsheet Program
Video Camera
VCR
TV
Videotape
Tools (for production activity selected)
Junior College and Technical School Course Catalogs

MATERIALS/ADVANCED:

Computer Paper
Current Newspapers and Magazines

APPLICATIONS OF TERMS:

System	Input
Process	Goals
Output	Resources
Capital	Labor
Finance	Energy
Planning	Organizing
Controlling	Hiring
Training	Separating
Forming	Combining
Consumer Products	Industrial Products
Military Products	Scrap
Waste	Hazardous Materials
Recycle	By-Product
Profit	Investment
Expenses	Unemployment
Relocation	Chamber of Commerce

REFERENCES:

Daiber, Robert A., and Thomas L. Erekson, Manufacturing Technology: Today and Tomorrow, Columbus, OH: Glencoe Publishing Co., 1991.

Wright, R. Thomas, and Richard M. Henak, Exploring Production, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

Wright, Thomas R., Processes of Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

REFERENCE: 1.4

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Incorporating a Business

MAJOR CONCEPT: Before any manufacturing corporation can be fully organized, it must become a legal company.

TOPICS:

Steps in Incorporating a Business
1) Prepare and File Articles of Incorporation
2) Prepare a Set of Bylaws
3) Receive Charter From the State
4) Elect a Board of Directors

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Identify the steps necessary to incorporate a business.
2. Prepare the records needed to obtain a corporation charter.
3. Interpret a corporate organization chart.

CORE INSTRUCTIONAL ACTIVITIES:

1. Prepare the articles of incorporation (determine the name of company, proposed activities, names and addresses of incorporators, location of company, and value and type of stock to be issued).
2. Prepare and approve bylaws (determine dates and places of stockholder meetings, dates and places of meetings of the board of directors, corporate officers and their duties, terms of office, types of proposals to be approved by stockholders, and method used to change bylaws).
3. Participate in election of the board of directors.
4. Discuss one or more examples of corporate organizational charts.
5. Prepare an organizational chart for the company.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Complete above activities.
2. Design certificate of incorporation using a computer program.
3. Design stock certificates using a computer program.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Examples of Corporate Organizational Charts, Stock Certificates, and Bylaws

MATERIALS/CORE:

None

TOOLS AND EQUIPMENT/ADVANCED:

Computer System
Graphics Arts Program or Software

MATERIALS/ADVANCED:
None

APPLICATIONS OF TERMS:

Bylaws	Board of Directors
Charter	Stock Certificate
Stockholder	Corporation
Incorporation	Stock

REFERENCES:

Daiber, Robert A., and Thomas L. Erekson, Manufacturing Technology: Today and Tomorrow, Columbus, OH: Glencoe Publishing Co., 1991.

Fales, J., E. Sheets, G. Mervich, and J. Dinan, Manufacturing: A Basic Text, Peoria, IL: Bennett and McKnight Publishing Co., 1986.

Wright, R. Thomas, Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1984.

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REFERENCE: 1.5

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Developing a Management Structure

MAJOR CONCEPT: Structuring a corporation involves identifying the jobs in the company and organizing these jobs according to the job responsibilities.

TOPICS:

1. Delegation of Responsibility
2. Lines of Authority
3. Availability of Personnel
4. Organizational Plan

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Discuss lines of authority, delegation of authority, and availability of personnel.
2. List and describe the components of a manufacturing company's organizational plan (organizational chart, job description manual, and employee handbook).

CORE INSTRUCTIONAL ACTIVITIES:

1. Identify the positions needed in the class manufacturing corporation.
2. Prepare the organizational chart for the class manufacturing company.
3. Prepare the job description manual to be used by the class manufacturing company.
4. Prepare an employee handbook to be used by the class manufacturing company.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Complete above activities.
2. Use a word processing program to generate a finished copy of the job description manuals.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Markers
Rulers

MATERIALS/CORE:

Poster Board

TOOLS AND EQUIPMENT/ADVANCED:

Computer System
Word Processing Software

MATERIALS/ADVANCED:
Computer Paper

APPLICATIONS OF TERMS:

President	Managers
Vice President	Supervisors
Engineers	Delegation
Lines of Authority	Manual

REFERENCES:

Fales, James, et al., Manufacturing: A Basic Text, Peoria, IL: Bennett and McKnight Publishing Co., 1986.

Wright, R. Thomas, Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1984.

Wright, R. Thomas, Exploring Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

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REFERENCE: 1.6

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Design Analysis Method

MAJOR CONCEPT: Problem solving techniques are used in product design.

TOPICS:

1. Justification for Design Analysis Method
2. Steps in Design Analysis Method
   - 2.1 State the problem
   - 2.2 Identify specifications/requirements
   - 2.3 Develop solutions
   - 2.4 Experiment
   - 2.5 Select final solutions

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Explain how the design analysis method makes manufacturing design problems easier to solve.
2. List and describe the five steps in the design analysis method of designing manufactured products.

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss what might be involved in design analysis of different products (i.e., plastic model helicopter and its package).
2. Prepare a statement of the problem, and list the specifications/requirements for the product design of a student-generated product idea.

ADVANCED INSTRUCTIONAL ACTIVITIES:

Prepare a statement of the problem and a list of the specifications/requirements, develop solutions, and make sketches for the product design of a student-generated product idea.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

None

MATERIALS/CORE:

None

TOOLS AND EQUIPMENT/ADVANCED:

Sketching Tools (graph paper, pencils, rulers, etc.)

MATERIALS/ADVANCED:

Sketching Paper

APPLICATIONS OF TERMS:

Function
Specifications
Experimentation
Final Design Solution
Materials
Design-Analysis Method
Alternate Design Solution

REFERENCES:

Fales, James, et al., Manufacturing: A Basic Text, Columbus, OH: Glencoe Publishing Co., 1986.

Lindbeck, J. R., and I. T. Lathrop, General Industry and Technology, Encino, CA: Bennett and McKnight Publishing Co., 1986.

Wright, R. Thomas, Exploring Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

REFERENCE: 1.7

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Product Design

MAJOR CONCEPT: Designers follow steps in product design as part of the product development cycle.

TOPICS:
1. Design Approaches (production and consumer approach)
2. Identifying Consumer Wants and Needs
3. Elements of Design (i.e., form, color, texture, size, and function)
4. Principles of Design
5. Preliminary Design
6. Detail Designs

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Identify and describe two approaches that manufacturing companies use in developing new products.
2. List ten products that were developed by the consumer approach and ten products that were developed by the production approach.
3. Generate product ideas for both approaches to design.
4. Discuss the goals of product design.
5. Prepare a list of possible products to be manufactured in class.
6. Identify and describe consumer survey techniques.
7. Identify the elements of design.
8. Discuss principles of design.
9. Describe the steps involved in product design.
10. Produce pictorial sketches of a product to be manufactured (oblique, cabinet, perspective, etc.).
11. Produce working drawings from sketches.

CORE INSTRUCTIONAL ACTIVITIES:
1. Examine catalogs and sales advertisements to identify products that are created by either a production or a consumer design approach.
2. Work in groups to form an idea for a product that can be designed and produced using the consumer method of product design.
3. Work in groups to form an idea for a product that can be designed and produced using the production method of product development.
4. Prepare a list of products that can be manufactured in the lab.
5. Prepare a survey form to identify which of the products in Activity 1 are the types of products that prospective consumers may want or need.
6. Conduct the survey among class members.
7. Compare group findings to determine the type of product and cost range for future production of product.
8. Identify and evaluate the various elements of design used on teacher-provided examples (see applications of terms).
9. Identify and evaluate the principles of design used on teacher-provided examples of products (chair, desk, model car, and tools in the lab).

10. Construct a chart to display the designs of models and prototypes that will be made in the engineering phase.
11. Use graph paper to make rough sketches of a selected product (can be the product to be used in Production Unit).
12. Use graph paper to refine rough sketches of products from Activity 1.
13. Produce dimensioned design sketches of the product(s).

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Complete Activities 4 and 5, and use the form to conduct a random survey of the student body, the faculty, parents, and neighbors.
2. Prepare a design analysis of a teacher- or student-provided product (appearance, function, durability, safety, and manufacturing feasibility).
3. Sketch preliminary designs for a selected product.
4. Use drafting equipment to generate preliminary drawings for a selected product.
5. Use Computer Aided Drafting (CAD) system to design preliminary drawings for a manufactured product.
6. Refine preliminary sketches and drawings using a Computer Aided Drafting (CAD) system.
7. Generate detailed design drawings using a Computer Aided Drafting (CAD) system.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Catalogs and Sales Ads
Markers
Drawing Pencils
Product Examples
Rulers
Drafting Equipment

MATERIALS/CORE:

Sample Survey Forms (see references)
Poster Board
Advertisements
Magazines
Graph Paper

TOOLS AND EQUIPMENT/ADVANCED:

Product Examples
Computer Aided Drafting (CAD) System
Drafting Equipment

MATERIALS/ADVANCED:

Assorted Consumer Guides
Drawing Paper

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APPLICATIONS OF TERMS:

Needs	Wants
Ideas	Consumer Approach
Production Approach	Data
Survey	Cost Analysis
Feasibility	Lines
Forms	Shapes
Texture	Color
Function	Unity
Variety	Proportion
Balance	Consumer Guides
Design Factors	Computer Aided Drafting (CAD)
Sketch	Pictorial
Oblique	Cabinet Drawing
Perspective	Graph Paper
Scale	Dimensions
Detail Drawings	Working Drawings
Assembly Drawings	Exploded View Drawings

REFERENCES:

Groneman, C. H., and G. C. Grann, Exploring the Industries, Albany, NY: Delmar Publishers, 1981.

Lindbeck, J. R., and I. T. Lathrop, General Industry and Technology, Peoria, IL: Bennett and McKnight Publishing Co., 1986.

Wright, R. Thomas, and Richard M. Henak, Exploring Production, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

REFERENCE: 1.8

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Research and Development

MAJOR CONCEPT: Research and development is the process by which new materials, processes, and products are derived through retrieval of information, description of existing things or ideas, and experimentation.

TOPICS:

1. Research Methods (retrieve, describe, and experiment)
2. Use of Research Results (materials and processes)
3. Destructive and Nondestructive Testing

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Use the three main ways of doing research (retrieving, describing, and experimenting) in developing the class product.
2. Analyze research data.
3. Select the best materials for the class product.
4. Perform various destructive and nondestructive tests on materials that may be used in the class product.

CORE INSTRUCTIONAL ACTIVITIES:

1. Retrieve information about the class product from catalogs, magazines, books, and other sources.
2. Describe a selection of teacher-supplied materials in terms of weight, color, texture, and ease of separation and forming.
3. Perform destructive and nondestructive tests on teacher-provided materials:
   - 3.1 Destructive and nondestructive testing for electrical resistance, fatigue, toughness, hardness, compression, durability, stress, ductility, malleability, machinability, thermal characteristics, and moisture content
   - 3.2 Acid resistance of various materials
   - 3.3 Flame resistance of various materials
   - 3.4 Corrosion resistance of various materials
   - 3.5 Tensile strength of various materials
   - 3.6 Strength of fasteners of various types

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Make charts comparing materials regarding selected characteristics from Activity 2.
2. Perform selected tests on material(s) (as in Activity 3).
3. Select the best materials for the class product using results of tests.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Grinder
Assorted Hammers
Magnet
Propane Torch Outfit
Vise
Arbor Press
Anvil
Pop Rivet Kit
Other Tools/Testing Equipment Needed to Test Various Materials

MATERIALS/CORE:

Various Materials Needed to Perform Tests (salt, water, woods, plastics, metals, leather, glass, fuels, chemicals, etc.)

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Same

APPLICATIONS OF TERMS:

Anvil
Describe
Research
Analyze
Electrical Resistance
Tensile Strength
Toughness
Compression
Stress
Malleability
Corrosion Resistance
Materials Chart
Softwood
Refractories
Alloys
Organic/Nonorganic Materials
ASTM (American Society of Testing and Materials)
Retrieve
Experiment
Destructive and Nondestructive Testing
Insulation
Fatigue
Hardness
Durability
Ductility
Machinability
Thermal
Hardwood
Ceramics
Chemicals
Polymers
Inorganic

REFERENCES:

Fales, James, et al., Manufacturing: A Basic Text, Columbus, OH: Glencoe Publishing Co., 1986.

Wright, R. Thomas, Exploring Manufacturing, Bloomington, IL: Goodheart-Willcox Company, Inc., 1985.

Wright, R. Thomas, Manufacturing Systems, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

REFERENCE: 1.9

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Product Engineering

MAJOR CONCEPT: Models, mock-ups, and prototypes are used to show the final appearance and engineering characteristics of the product.

TOPICS:

1. Engineering Design for Function
2. Engineering Design for the Requirements of Manufacturing
3. Engineering Design for Fulfilling Consumer Wants or Needs
4. Models
5. Appearance Mock-Ups
6. Prototypes
7. Engineering Tests (durability, operation, feasibility, and safety)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify engineering design factors to be considered in product engineering (function, manufacturing, feasibility, safety, cost, and selling appeal).
2. Research engineering considerations for selected products.
3. Analyze designs according to engineering requirements.
4. Construct a mock-up of a product design.
5. Identify changes/improvements to be made on the mock-up from Activity 4.
6. Produce working drawings that reflect the identified changes/improvements from Activity 4.
7. Construct a product prototype from the working drawings.
8. Explain why engineering testing is an important step in the product development process.
9. Identify the areas to be evaluated in the engineering testing phase of product design.
10. Perform engineering tests on product mock-up and prototype.

CORE INSTRUCTIONAL ACTIVITIES:

1. Work in groups to research designs and engineering requirements for different types of products that have been identified by the instructor/student.
2. Evaluate, as a group, the design and engineering factors for several products of the selected type, and present the evaluations to the class.
3. Discuss the relationship of function to performance.
4. Construct a soft mock-up of a product.
5. Construct a model of a redesigned product.
6. Work in groups to make an appearance mock-up for the product that has been selected for the production unit.
7. Construct a prototype for the product that has been selected for the production unit.

8. Generate a checklist for testing the prototype (Ref. 1.6) from the original statement of the product's function.
9. Devise testing techniques to evaluate the function of the product mock-up or prototype.
10. Test the product mock-up or prototype, and either approve the design or send the product back with recommendations for change.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Build a rough model or mock-up for one of the product ideas, and conduct a survey to recommend improvements that will satisfy both the consumer and the production requirements of the product.
2. Construct a model of the product in #1.
3. Produce an appearance mock-up for the product selected for the production unit.
4. Produce a prototype for the product selected for the production unit.
5. Complete Activities 8-10.
6. Conduct final evaluation to determine the manufacturing feasibility for the product.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Special Equipment Needs Determined by the Nature of the Product and the Nature of the Testing

MATERIALS/CORE:

Special Material Needs Determined by the Nature of the Product and the Nature of the Testing

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Same

APPLICATIONS OF TERMS:

Durability	Operation
Safety	Feasibility
Engineering	Checklist
Product Life Expectancy	Function
Mock-Up	Prototype
Model	Component Part

REFERENCES:

Groneman, C. H., and G. C. Grann, Exploring the Industries, Albany, NY: Delmar Publishers, 1981.

Lindbeck, J. R., and I. T. Lathrop, General Industry and Technology, Peoria, IL: Bennett and McKnight Publishing Co., 1986.

Wright, R. Thomas, and Richard M. Henak, Exploring Production, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

Wright, R. Thomas, Manufacturing Systems, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

REFERENCE: 2.1

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Establishing Accident Prevention Programs

MAJOR CONCEPT: Accident prevention is a responsibility of all management.

TOPICS:
1. Safety Engineering (equipment, environment, and facility)
2. Education/Safety Training/Attitude Development
3. Personal Protective Equipment
4. Encouragements (awards and reminders)
5. Enforcements (rules and discipline)
6. Basic First Aid/Emergency Procedures

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Explain why safety on the job is important to oneself and the company (economic, legal, moral, and personal reasons).
2. List and explain the five "E's" of a safety program (engineering, education, encouragement, enforcement, and enthusiasm).
3. Develop a safety program, poster, and checklist.
4. Demonstrate a positive attitude regarding safety (i.e., obedience to safety rules).
5. Suggest ways to prevent accidents in the school lab (equipment, behavior, rules, etc.).
6. Explain reasons for wearing personal protective equipment.
7. Participate in a safety meeting.
8. Identify and inspect critical areas of the laboratory.

CORE INSTRUCTIONAL ACTIVITIES:
1. Develop safety posters and slogans.
2. Discuss why safety in the school and on the job is important.
3. Develop and use an equipment safety checklist.
4. Develop a class corporation safety program that includes aspects of Topics 2-5.
5. Explain reasons for wearing safety equipment in class.
6. Conduct a safety meeting on a teacher-assigned safety topic.
7. Conduct a laboratory safety inspection.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Develop a safety checklist to check safety at home.
2. Develop a safety manual to be used by the class.
3. Produce a slide show on safety in the Industrial Technology Lab.

EVALUATION:
Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
Safety Equipment
Pencils
Markers

MATERIALS/CORE:
Poster Paper

TOOLS AND EQUIPMENT/ADVANCED:
Same
Camera

MATERIALS/ADVANCED:
None

APPLICATIONS OF TERMS:

Attitudes	Combustibles
Machine Guards	Occupational Safety Hazard Act (OSHA)
Persistence	Reliability
Safety Zone	Safety Hazard

REFERENCES:

Fales, James, et al., Manufacturing: A Basic Text, Columbus, OH: Glencoe Publishing Co., 1986.

Hammer, Willie, Occupational Safety and Health Engineering, Englewood Cliffs, NJ: Prentice-Hall, 1986.

Wright, Thomas R., Processes of Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

REFERENCE: 2.2

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Hiring

MAJOR CONCEPT: The personnel department hires the best qualified people for the available positions.

TOPICS:

1. Job Descriptions (D.O.T.)
2. Recruiting
3. Applications and Applying for a Job
4. Interviews
5. Selection
6. Hiring
7. Wages/Benefits

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Participate in a discussion on what an employment manager looks for in job applicants.
2. Identify manufacturing openings from classified ads.
3. Fill out a job application form.
4. Identify a job description from the D.O.T.
5. Discuss wages and benefits.
6. Apply for a job and role-play the interview process.
7. Compute the annual wage from an hourly rate.

CORE INSTRUCTIONAL ACTIVITIES:

1. Participate in classroom discussions of personnel selection and recruiting.
2. Identify job openings from classified ads.
3. Use D.O.T. to identify qualifications for class corporation jobs.
4. Prepare brief job descriptions for the class corporation.
5. Fill out an industry supplied job application.
6. Role-play applying for jobs and job interviews.
7. Assign hourly wages to corporation jobs, and calculate yearly income of each job.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Create a job application form.
2. Prepare job descriptions, and analyze jobs in terms of specific job duties, working conditions, and hiring requirements.
3. Develop brief training programs, and train workers for identified jobs.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
Classified Advertisements
Dictionary of Occupational Titles

MATERIALS/CORE:
Industry Supplied Job Applications

TOOLS AND EQUIPMENT/ADVANCED:
None

MATERIALS/ADVANCED:
None

APPLICATIONS OF TERMS:

Advertise	Application
Interview	Fringe Benefits
Laid Off	Management
Personnel Department	Pay Scale
Qualifications	References
Classified Ad	Job Description
Recruiting	Directory of Occupational Titles (D.O.T.)
Wage	Benefits
Hourly Rate	

REFERENCES:

Daiber, Robert A., and Thomas L. Erekson, Manufacturing Technology: Today and Tomorrow, Columbus, OH: Glencoe Publishing Co., 1991.

Fales, James, et al., Manufacturing: A Basic Text, Columbus, OH: Glencoe Publishing Co., 1986.

Wright, R. Thomas, Manufacturing Systems, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

REFERENCE: 2.3

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Training

MAJOR CONCEPT: After a person is hired, s/he participates in a training program dealing with the job s/he is expected to perform.

TOPICS:
1. On-the-Job Training (OJT) by Performing the Job Under Supervision
2. Classroom Training (in plant or other school)
3. Vestibule (in plant using actual equipment, but not in the production situation)
4. Safety Training

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Discuss types of training programs in manufacturing.
2. Determine the type of training needed for various jobs involved in the manufacturing of the class project.
3. Design a training program.
4. Complete training for a production job successfully.
5. Pass a safety exam with 90% proficiency.

CORE INSTRUCTIONAL ACTIVITIES:
1. Identify various jobs (ads, parents, or community), and discuss the type of training needed for each job.
2. Identify the type of training program needed for each job in the class corporation.
3. Design a training program for each job in the class corporation.
4. Train class production workers.
   - 4.1 Teacher might train selected workers, and these people, in turn, train the rest.
   - 4.2 Teacher trains all workers.
5. Take a safety test.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Identify training needs for the production jobs involved with producing the class product.
2. Develop a schedule, and train workers for various production jobs involved in producing the class product.
3. Complete a safety test successfully.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
None

MATERIALS/CORE:
Newspaper (classified ads)
Safety Tests

TOOLS AND EQUIPMENT/ADVANCED:
Standard Classroom Equipment

MATERIALS/ADVANCED:
List of Students and Jobs for Which They Are to Be Trained
Safety Tests

APPLICATIONS OF TERMS:

On-the-Job Training	Classroom Training
Vestibule	Training Program
Production Job	Job
Simulated Production	Coaching

REFERENCES:

Daiber, Robert A., and Thomas L. Erekson, Manufacturing Technology: Today and Tomorrow, Columbus, OH: Glencoe Publishing Co., 1991.

Wright, R. Thomas, Exploring Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

Wright, Thomas R., Processes of Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

REFERENCE: 2.4

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Organized Labor and Collective Bargaining

MAJOR CONCEPT: Unions collectively bargain for their members so that the individual does not have to negotiate with the company for better employee benefits.

TOPICS:

1. Purpose of Labor Unions
2. Procedures for Negotiation of a New Contract Between a Union and a Company
3. Duties of Union Officers
4. Elements of a Typical Contract

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Explain the purpose of labor unions, and tell why a worker would or would not want to belong to one.
2. Explain the procedures for negotiation of a new contract between a union and a company.
3. Define contract, and outline the elements in a typical contract.
4. Explain what is meant by collective bargaining, and list three factors that may be involved in bargaining (wages, hours, and working conditions).
5. Name two steps taken before striking in an attempt to solve a labor management problem (union proposal, company counterproposal, negotiation, mediation, and arbitration).

CORE INSTRUCTIONAL ACTIVITIES:

1. Arrive at a solution, given a collective bargaining situation, by following the appropriate procedure (role-play one half of class--labor, other half of class--management).
2. Discuss reasons for and against joining a union.
3. Discuss reasons why labor management friction occurs and the steps to reaching a solution.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Read about the history of collective bargaining, and make a presentation to the class on what you found.
2. Use collective bargaining procedures to solve the problem (role-playing) given a labor management dispute.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

None

MATERIALS/CORE:

Example of a Union Contract

TOOLS AND EQUIPMENT/ADVANCED:
None

MATERIALS/ADVANCED:
None

APPLICATIONS OF TERMS:

Arbitration	Locals
Authorization Cards	AFL-CIO
Certification	Wagner Act
Collective Bargaining	Teamsters
Contract	Negotiate
Counterproposals	Grievance
Negotiations	NLRB
Proposals	Shop Steward
Union	

REFERENCES:

Daiber, Robert A., and Thomas L. Erekson, Manufacturing Technology: Today and Tomorrow, Columbus, OH: Glencoe Publishing Co., 1991.

Wright, R. Thomas, Exploring Manufacturing, South Holland, IL: Goodheart-Willcox Co., 1985.

Wright, Thomas R., Processes of Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

REFERENCE: 3.1

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Extracting Raw Materials

MAJOR CONCEPT: Industries obtain raw materials for manufacturing from the land, water, and air.

TOPICS:

1. Hydrocarbon Fuels (coal, gas, oil, and peat)
2. Raw Materials From the Air (oxygen, helium, hydrogen, nitrogen, neon, argon, etc.)
3. Raw Materials From the Sea (gold, salt, magnesium, water, oxygen, hydrogen, sodium, etc.)
4. Raw Materials From the Land (iron, lead, copper, zinc, gold, silver, platinum, coal, peat, oil, line, emery, etc.)
5. Renewable Resources (trees, cotton, wool, flax, and hides)
6. Exhaustible Resources (metal ores, petroleum, natural gas, coal, and marble)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Describe ways hydrocarbons are obtained.
2. Describe ways ores are mined.
3. Describe ways raw materials are obtained from the air.
4. Describe ways raw materials are obtained from the land.
5. Describe ways raw materials are obtained from the water.
6. List raw materials available from South Carolina.
7. List raw materials available and unavailable in the United States.
8. Identify countries which supply particular raw materials to the United States.

CORE INSTRUCTIONAL ACTIVITIES:

1. Make a map, and locate where raw materials may be found in South Carolina (emery, gold, titanium, sand, clay, rock, lime, etc.).
2. Make a map (or use a world map), and locate where raw materials may be found in the United States/world.
3. Separate sand and other aggregate (screening).
4. Separate brass or lead from sand by panning.
5. Mine clay and separate it from the debris.
6. Describe the way coal is mined (open pit, strip, and shaft mining).
7. Discuss methods of extracting oil.
8. Discuss the methods of obtaining raw products from the air (nitrogen, oxygen, helium, and the rare gases).
9. List renewable resources from the land (trees and other plants).
10. Discuss primary processes of obtaining raw materials (mining, forestry, farming, pumping, etc.).

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Convert yellow pine to wood pulp, and make paper.
2. Make peanut oil using a blender.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Dictionary	Encyclopedias
Maps	Globe
Plans (mines, oil drilling, forestry operations, etc.)	

MATERIALS/CORE:

Aggregates	Brass Filings
Sand	Iron Filings
Clay	

TOOLS AND EQUIPMENT/ADVANCED:

Blender	Drying Rack
Pressure Cooker	Hot Pressing Iron
Screen Wire	

MATERIALS/ADVANCED:

Wood Pulp	Pencil
Bleach	Sand
Alkali	Aggregates
Peanuts	Brass Filings
Iron Filings	Clay

APPLICATIONS OF TERMS:

Resources	Hydrocarbons
Aggregates	Ores
Components	Renewable Resources
Extraction	Exhaustible Resources
Distribution	Open Pit Mining
Harvesting	Strip Mining
Shaft Mining	

REFERENCES:

Fales, James, et al., Manufacturing: A Basic Text, Columbus, OH: Glencoe Publishing Co., 1986.

Wright, R. Thomas, Exploring Manufacturing, South Holland, IL: Goodheart-Willcox Company, Inc., 1985.

Wright, Thomas R., Processes of Manufacturing, South Holland, IL: Goodheart-Willcox Company, Inc., 1990.

REFERENCE: 3.2

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Primary Processes of Making Basic Materials

MAJOR CONCEPT: Raw materials have to be refined or processed for use in industry.

TOPICS:
1. Refining Iron Ore
2. Processing Latex Rubber
3. Refining Oil
4. Processing Products from the Forest
5. Reducing Aluminum
6. Processing Seawater to Obtain Magnesium and Salt
7. Processing Air to Obtain Pure Gas Elements

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Discuss the basic process of making iron and steel.
2. Explain how latex rubber is produced.
3. Discuss how finished materials are obtained from petroleum (refining).
4. Discuss how products from the forest are processed.
5. Explain how aluminum is reduced.
6. Explain and discuss how products are obtained from seawater.
7. Explain two methods of obtaining pure oxygen (air reduction and electrolysis of water).

CORE INSTRUCTIONAL ACTIVITIES:
1. In groups of three or four students, make a chart illustrating one of the following:
   - 1.1 Latex rubber production
   - 1.2 Iron ore production
   - 1.3 Cracking petroleum
   - 1.4 Forestry operations
   - 1.5 Reducing aluminum
   - 1.6 Processing seawater to obtain magnesium
   - 1.7 Obtaining pure oxygen by air reduction and by electrolysis
2. Separate the impurities from molten lead through skimming.
3. Evaporate salt from "seawater" (evaporation of concentrated salt solution).

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Make a flow chart showing how steel is produced from pig iron.
2. Make a chart showing all the steps for making turpentine.
3. Comb and clean raw wool or cotton. Spin it into thread. Make a pot holder or similar size product from the thread.

EVALUATION:
Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Hot Plate or Other Heating Means (oxyacetylene or propane torch)

Steel Container	Scissors
Metal Spoon	Rulers

MATERIALS/CORE:

Poster Board	Water
Salt	Lead
Pens	

TOOLS AND EQUIPMENT/ADVANCED:

Electric Stove	Spinning Bobbins
Steel Container	Nail-Frame Loom
Metal Spoon	Wire Cards
Scissors	Ruler

MATERIALS/ADVANCED:

Turpentine	Pine
Raw Wool or Cotton	Solvents for Cleaning Fibers

APPLICATIONS OF TERMS:

Turpentine	Steel
Refining	Iron Ore
Aluminum	Latex Rubber
Lead	Sodium
Magnesium	

REFERENCES:

Feirer, John L., General Metals, New York: McGraw-Hill, 1984.

Graham, Gregory S., Metalworking: An Introduction, Boston, MA: Breton Publishing, 1981.

Johnson, Harold V., Manufacturing Process, Encino, CA: Bennett Publishing Co., 1984.

Ludwig, Oswald A., et al., Metalwork: Technology and Practice, Bloomington, IL: McKnight Publishing, 1985.

Wright, R. Thomas, Exploring Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

REFERENCE: 3.3

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Separating by Chip Removal

MAJOR CONCEPT: In chip removing, material is separated and removed in the form of shavings or chips.

TOPICS:

1. Turning and Threading
2. Sawing
3. Filing and Broaching
4. Milling and Related Operations
5. Drilling, Boring, Reaming, Tapping, Counter Drilling, Step Drilling, Counter Boring, Counter Sinking, Reaming, and Spotfacing
6. Abrasive Machining: Grinding, Sanding, Loose-Media, and High-Finish Processes

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Perform a variety of chip-removing processes.
2. Identify materials on which chip-removing processes are used.
3. Identify chip-removing processes as they apply to laboratory being used.

CORE INSTRUCTIONAL ACTIVITIES:

1. Perform as many chip-removing practices as possible that are listed in the suggested topics.
2. Identify the chip-removing processes used in the school laboratory.
3. Identify materials on which chip-removal processes are used.
4. Identify and perform chip-removing processes as they apply to the class product or project.
5. Produce a simple product using separation equipment.
6. Identify and describe the similarities in the tools, machines, and processes as they are used in the laboratory.
7. Name the three types of motion used in separating (rotating, reciprocating, and linear).
8. Use the Computer Numerical Control (CNC) mill or Computer Numerical Control (CNC) lathe to make a product.
9. Do practice drilling on different types of material.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Design and manufacture a simple project using the CNC lathe or CNC mill (metal, plastic, or wax).
2. Discuss the cutting materials used for cutting other materials:
    - 2.1 Carbon tool steel
    - 2.2 High speed steel
    - 2.3 Cast nonferrous alloys
    - 2.4 Diamond
    - 2.5 Carbides, tungsten, and alloys
    - 2.6 Sintered oxides and ceramics

3. Use machine cutting tools in the laboratory to cut out components for the class project.
4. Compare the cutting rate of different types of abrasives on standard materials.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Computer	Power Hacksaw
CNC Lathe	Band Saw
CNC Mill	Shaper
Wood Working Lathe	Grinder/Buffer
Metal Working Lathe	Sander
Wood Working Hand Tools	Metal Working Hand Tools
Drill Bits	Abrasive Cutoff Machine
Table Saw	Drill Press

MATERIALS/CORE:

Wood
Metal
Sandpaper
Plastic

TOOLS AND EQUIPMENT/ADVANCED:

Abrasive Machinery and Finishing Tools

Computer	CNC Lathe
Drill Bits	CNC Mill
Files	Sander
Wood Working Lathe	Grinder/Buffer
Metal Working Lathe	Planer
Wood Working Hand Tools	Shaper
Metal Working Hand Tools	Power Hacksaw
Table Saw	Band Saw
Drill Press	

MATERIALS/ADVANCED:

Wood
Sandpaper
Metal
Plastic
Abrasives

1. Silicon Carbide
2. Aluminum Oxides
3. Aluminum Oxide/Zirconium Oxide Cofusion
4. Sintered Bauxite
5. Cubic Boron Nitride (CBN)
6. Diamonds
7. Variety of Polishing Compounds

APPLICATIONS OF TERMS:

Sawing	Jointing
Drilling	Broaching
Milling	Honing
Planing	Buffing
Shaping	Polishing
Turning	Lapping
Filing	Scraping
Boring	Brushing
Tapping	Blasting
Threading	Grinding
Routing	Chopping
Abrading	Chiseling
Reaming	Crushing
Tumbling	Vibrating

REFERENCES:

Linbeck, John R., and Irvin T. Lathrop, General Industry and Technology, Peoria, IL: Bennett and McKnight Publishing Co., 1986.

Shackelford, Ray, Introduction to Separation Mf-P-013, Center for Implementing Technology Education, Department of Industry and Technology, Ball State University: Muncie, IN 47306.

Shackelford, Ray, Abrasive Machining Mf-P-030, Center for Implementing Technology Education, Department of Industry and Technology, Ball State University: Muncie, IN 47306.

Wright, Thomas R., Processes of Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

Wright, R. Thomas, Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1984.

REFERENCE: 3.4

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Shearing

MAJOR CONCEPT: Shearing separates materials without the formation of chips or the use of burning or melting.

TOPICS:
1. Shearing and Slitting
2. Blanking, Cutting, and Parting
3. Punching, Perforating, and Slotting
4. Notching and Lancing
5. Trimming and Shaving

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Identify and perform at least five basic shearing operations utilizing a variety of tools and techniques.
2. Identify and describe different shearing operations commonly used in the home.
3. Identify and describe shearing operations used in industry. Discuss these industrial applications, and compare them to applications in the laboratory and at home.
4. Identify and use the shearing processes and the tools needed to perform shearing operations during the production of a class mass-production project.

CORE INSTRUCTIONAL ACTIVITIES:
1. Use the bench shear and squaring shear to cut out a minimum of two sheet metal blanks from different materials (copper blanks for name plates and aluminum blanks for bowls to be used in other units).
2. Perform at least five different shearing operations on a variety of different materials (paper, leather, wood, plastic, styrofoam, and metal). Discuss the differences in the processes due to the materials and tools involved.
3. Shear a piece of copper tubing and a piece of PVC pipe using a rotary cutter.
4. Perform shearing operations necessary to the production of the class mass production project.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Design and make a tool for notching computer disks.
2. Design a simple project which involves at least three different shearing operations. Construct the project. Analyze the potential for mass production.
3. Perform the shearing processes to be used in mass producing the class product.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Bench Shears
Squaring Shears
Sheet Metal Punch
Leather Punch
Sharp Knife
Paper Punch
Scissors
Tubing Cutter
Aviator or Tinner's Shears

MATERIALS/CORE:

Wood
Plastic
Sheet Aluminum
Sheet Copper
Styrofoam
Paper
Cardboard
Leather
PVC Pipe
Copper Tubing

TOOLS AND EQUIPMENT/ADVANCED:

Leather Punch
Heavy Duty Shears
Sheet Metal Punch
Aviator Shears
Equipment (as needed for mass production activity)

MATERIALS/ADVANCED:

Sheet Copper
Leather
Sheet Aluminum
Flat Steel
Other Materials (according to requirements of Activity 2)

APPLICATIONS OF TERMS:

Shearing
Die Cutting
Lancing
Trimming
Shaving
Rotary Shearing
Scoring
Notching
Slitting
Blanking
Punching
Slotting
Perforate

REFERENCES:

Johnson, Harold V., Manufacturing Process, Encino, CA: Bennett Publishing Co., 1984.

Wright, R. Thomas, Exploring Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

Wright, R. Thomas, Manufacturing Systems, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

REFERENCE: 3.5

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Separation by Other Processes

MAJOR CONCEPT: Processes other than shearing and chip removal can be used to separate materials.

TOPICS:

1. Electrical Discharge Machining (EDM)
*2. Electrochemical Machining (ECM)
3. Chemical Machining
*4. Laser Machining
*5. Electron Beam Machining
6. Flame Cutting
*7. Plasma Arc Cutting
8. Induced Fracturing
9. Screening
10. Flotation
11. Filtration
12. Magnetic Separation
13. Evaporation
14. Distillation
15. Centrifuging
16. Absorption
17. Sedimentation
18. Leaching
19. Friction Sawing
*20. Combing

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Explain and demonstrate methods to separate materials other than by shearing and chip removal.
2. Explain why these processes are not shearing and chip removal processes.
3. Perform a minimum of two "other separating processes."

CORE INSTRUCTIONAL ACTIVITIES:

1. Cut a hole in thin brass using an electrical discharge machine.
2. Compare and contrast EDM with more traditional types of machining.
3. Separate oil from water using cotton (absorption).
4. Machine a piece of aluminum chemically.
5. Cut steel with an oxyacetylene torch (flame cutting).
6. Induce a fracture in glass or tile using a glass or tile cutter (fracturing).
7. Separate gravel from sand using screen wire (screening).
8. Separate common clay to be used in ceramics from the impurities (rocks, sand, and vegetable matter) by dissolving it in water (flotation or sedimentation), then screening.
9. Evaporate water from the clay to be used in ceramics.

10. Separate steel filings from brass and aluminum using a magnet (magnetic separation).
11. Separate aluminum filings from brass filings by using water (flotation by panning).
12. Distill dirty water; test and compare its purity with the original.
13. Separate honey from a corn cob by using a centrifuge.
14. Filter impurities from water contaminated with foreign matter.
15. Leach salt from soil in a container by pouring water through the mixture. Collect the liquid, evaporate it, and collect the salt.
16. Discuss the topics identified by asterisks.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Construct an Electrical Discharge Machine (EDM).
2. Compare a common chip removal process with "other separating processes."
3. Build an electromagnet for separating aluminum from iron.
4. Make a stained glass window.
5. Attach a laser trainer to an armoroid; trace a pattern on a piece of photographic film to demonstrate laser cutting.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Electric Discharge Machine	Magnet
Oxyacetylene Torch	Centrifuge
Still	Metal Bucket
Glass Cutter	Screen Wire
Glass Container (for ECM)	

MATERIALS/CORE:

Photo Resist	Acetylene Gas
Gravel and Sand	Aluminum Filings
Clay	Brass Filings
Steel Filings	Honey
Glass	Salt
Tile	Cotton
Formica	Acid Resist Paint
Corncob	Muriatic Acid

TOOLS AND EQUIPMENT/ADVANCED:

Armatron	Red Safe Light
Laser Trainer	Developing Trays
Computer	Metal Bucket
Core for Magnet	

MATERIALS/ADVANCED:

Photographic Film	Stop Bath
Developer	Copper Wire (28 gauge)
Fixer	Battery

APPLICATIONS OF TERMS:

- Computer
- Laser
- Armatron
- Battery
- Electrical Discharge Machine
- Electromagnet
- Electrochemical Machinery
- Electron Beam Machinery
- Flame Cutting
- Plasma Arc Cutting
- Leaching
- Sedimentation
- Absorption
- Centrifuge
- Distillation
- Evaporation
- Magnetic Separation
- Filtration
- Screening
- Fracturing

REFERENCES:

Linbeck, John R., and Irvin T. Lathrop, General Industry and Technology, Peoria, IL: Bennett and McKnight, 1986.

Wright, R. Thomas, Exploring Manufacturing, South Holland, IL: Goodheart-Willcox Co., 1985.

Wright, Thomas R., Processes of Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

REFERENCE: 3.6

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Casting and Molding

MAJOR CONCEPT: Casting or molding is pouring or forcing a liquid or soft material into a cavity so that the material takes the shape of the cavity when it cools or sets.

TOPICS:
1. Metal Casting
2. Plastic Casting
3. Ceramics Casting
4. Glass Casting
5. Advantages and Disadvantages of Casting
6. Examples of Cast Products
7. Casting Machines and Equipment

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Describe at least four types of casting (green sand, dry-sand mold, shell mold, full mold, investment mold, permanent mold, die casting, centrifugal, gravity, injection molding, compression molding, and dip).
2. Discuss how casting developed.
3. Discuss the advantages and disadvantages of casting and molding.
4. Name five kinds of expendable molds (green sand, dry sand, shell, investment, and plaster).
5. Name three kinds of permanent molds (die, centrifugal, plaster, and permanent iron).
6. Slip cast ceramics.
7. Make an investment casting.
8. Make a plastic injection molded product.

CORE INSTRUCTIONAL ACTIVITIES:
1. Slip cast ceramics.
2. Design, make a pattern, and pour a full sand mold casting using expanded polystyrene.
3. Cast a project using green-sand casting techniques.
4. Make candles using a permanent mold.
5. Make a permanent-mold lead soldier.
6. Make a dip casting using plastic or latex materials (balloons, gloves, etc.).
7. Use the injection molding machine.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Make a pattern with allowances for shrinkage, machine finish, size, tolerances, and draft.
2. Cast the project in a green sand molding using the pattern made in Activity 1.
3. Remove and clean the item.
4. Design and make jewelry using the lost wax or investment technique.

5. Cast jewelry centrifugally.
6. Make and use a ceramic mold using plaster of paris.
7. Slip cast ceramics using the mold made in Activity 6.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Ceramics Kiln
Dip Casting Molds
Green Sand Mold Patterns
Green Sand Molding Equipment (e.g., flasks and molding tools)
Safety Clothing and Equipment
Plastics Injection Molder
Furnace/Kiln (gas or electric)
Permanent Candle Mold

MATERIALS/CORE:

Nylons and Epoxies for Compression Molding
Expended Polystyrene for Full Molds
Polyvinyl Chloride Resins for Dip Molding

Wax	Slip
Plaster of Paris	Green Sand
Molding Sand	Copper for Jewelry
Scrap Metal	Propane Gas
Pop Bottles	Pop Rivets
Paper	Pencil
Injection Plastic	

TOOLS AND EQUIPMENT/ADVANCED:

Wood Carving Tools
Investment Mold Oven
Permanent Candle Mold
Furnace/Kiln (gas, electric, or induction)
Safety Clothing and Equipment
Green Sand Molding Equipment (e.g., flasks and molding tools)
Grinder With Wire Brush and Grinding Stone
Centrifuge Casting Machine
Dip Casting Molds

MATERIALS/ADVANCED:

Scrap Metal	Propane Gas
Wax	Slip
Plaster of Paris	Green Sand
Copper for Jewelry	Latex for Dip Molding

Expended Polystyrene for Full Molds

APPLICATIONS OF TERMS:

Green Sand Casting	Plaster Mold Casting
Dry Sand Casting	Permanent Mold Casting
Shell Mold Casting	Slush Casting
Full Mold Casting	Die Casting
Investment Casting	Centrifugal Casting

REFERENCES:

Johnson, Harold V., Manufacturing Process, Encino, CA: Bennett Publishing Co., 1984.

Lindbeck, John P., and Irvin T. Lathrop, General Industry and Technology, Peoria, IL: Bennett and McKnight, 1986.

Wright, R. Thomas, Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1984.

Wright, Thomas R., Processes of Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

REFERENCE: 3.7

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Forming

MAJOR CONCEPT: All forming processes have in common the deformation of a material to force it into a new shape without reducing its weight.

TOPICS:

1. Hot and Cold Rolling
2. Compressing
3. Bending
4. Forging
5. Stretching
6. Drawing
7. Extruding
8. Hammering/Peening
9. Pressing
10. Stamping
11. Spinning
12. Vacuum Forming
13. Combing
14. Knitting
15. Weaving
16. Crystallizing
17. Conditioning

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify the two major categories of forming (cold forming and hot forming).
2. Identify eight forming processes (i.e., hammering, compressing, bending, stamping, combing, spinning, crystallizing, and stretching).
3. Identify four tools or machines which are used in the forming processes (i.e., hammer, stamps and dies, bar folder, and comb).
4. Demonstrate a variety of forming processes using the equipment available in the laboratory.
5. Identify forming processes used in the production of a class mass production project. Discuss and evaluate the processes.

CORE INSTRUCTIONAL ACTIVITIES:

1. Hammer an aluminum bowl to illustrate drop forging. (See Reference 3.4)
2. Make a nameplate from a copper blank using die stamps. (See Reference 3.4)
3. Stretch a glass rod by applying heat and pressure. Experiment with bending and shaping the rod during the stretching process (wear safety glasses and gloves).
4. Make rock candy from a sugar water solution to demonstrate crystallization.
5. Compress sawdust and glue into a small fire log.
6. Make a corner bracket by bending a piece of sheet metal with a bar folder.
7. Comb cotton or wool, and process the combed material into thread by spinning.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Design and make a die for use on the arbor press.
2. Make a plastic salad bowl using a mated die.

3. Experiment with brass or iron filings and plastic resin to illustrate the powder metallurgy process.
4. Identify the forming tools used in the laboratory, and discuss the nature of the shapes that result from using the tools. Identify the processes and discuss the desired outcomes.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Die Stamps
Arbor Press
Propane Torch With Gas Cylinder
Wood or Metal Molds (e.g., 3" pipe)
File Cards
Ball Peen Hammers
Bar Folder

MATERIALS/CORE:

Sheet Aluminum
Copper Blanks
Glass Rods
Sawdust and Glue
Sheet Metal
Cotton or Wool
Sugar
Water

TOOLS AND EQUIPMENT/ADVANCED:

Arbor Press
Mated Die
CNC Milling Machine (lathe)
Forming Tools (general laboratory tools)

MATERIALS/ADVANCED:

Assortment of Pipes (molds for powder metallurgy)
Blanks for Die (CNC)
Brass or Iron Filings
Wood or Metals for Dies
Plastic Sheet

APPLICATIONS OF TERMS:

Forming
Slip Casting
Bending
Extrusion
Stretching
Thermoforming
Piercing
Metallurgy
Pressing
Spinning
Forging
Centrifugal Casting
Squeezing
Roll Forming
Peening
Blow Molding
Drawing
Powder Metallurgy

REFERENCES:

Johnson, Harold V., Manufacturing Process, Encino, CA: Bennett Publishing Co., 1984.

Lindbeck, John P., and Irvin T. Lathrop, General Industry and Technology, Peoria, IL: Bennett and McKnight Publishing Co., 1986.

Wright, Thomas R., Processes of Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

REFERENCE: 3.8

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Conditioning

MAJOR CONCEPT: Conditioning processes alter the structure of materials to improve mechanical and physical properties. The shape of the material is altered little or not at all.

TOPICS:

1. Thermal (annealing, normalizing, hardening, tempering, drying, and firing)
2. Mechanical (shot peening and tumbling)
3. Chemical Processes (catalysts)
4. Magnetizing (electromagnetic)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Describe six properties involved in the conditioning process (strength, elasticity, ductility, toughness, hardness, and moisture content).
2. Define four types of material strengths (tensile, compression, shear, and torsion).
3. Describe four conditioning processes.
4. Perform two conditioning processes.
5. Perform one experiment with a material before and after conditioning.

CORE INSTRUCTIONAL ACTIVITIES:

1. Kiln dry green lumber, and discuss why wood is dried.
2. Fire a ceramic product in a kiln.
3. Design and forge a chisel, then harden and temper it using the proper techniques.
4. Embed small objects in clear cast resin to make a paperweight.
5. Compare soft copper with copper work hardened by peening. Then anneal the copper. (Experiment with "stiffness" using a spring scale and copper strips.)
6. Magnetize a screwdriver using an electromagnet. Cast plastic to the handle (chemical conditioning).
7. Roll and bake clay or cookie dough (demonstrates thermal conditioning).

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Use ball bearings or abrasive to mechanically condition a piece of copper using a sand/shot blasting machine or gem tumbler. Test/Compare hardness with a file or punch struck with a standard force.
2. Pack carburize a piece of steel, and test for increased hardness using a file.
3. Test ductility of thermoplastics at varying temperatures.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

- Kiln for Lumber
- Kiln for Ceramics
- Anvil
- Personal Safety Equipment
- Molds for Clear Cast
- File to Test Hardness
- Tongs
- Forging Hammer
- Ceramic Molds

MATERIALS/CORE:

- Classroom Materials
- Slip
- Materials to Be Conditioned (e. g., plastic, wood, glass, metal, or cookie dough)
- Clear Cast With Catalyst
- Carbonizing Material
- Paint
- Varnish

TOOLS AND EQUIPMENT/ADVANCED:

- Metal Files
- Sand Blast Machine
- Anvil
- Gem Tumbler

MATERIALS/ADVANCED:

- Thermoplastic
- Standard Laboratory Equipment
- Electromagnet
- Pack Carbonizing Powder or Case Hardening Powder
- Ball Bearings

APPLICATIONS OF TERMS:

- Annealing
- Hardening
- Drying
- Tensile Strength
- Shear Strength
- Elasticity
- Toughness
- Moisture
- Kiln
- Surface Hardening
- Normalizing
- Tempering
- Firing
- Compressive Strength
- Torsion Strength
- Ductility
- Hardness
- Content
- Charcoal
- Carbon

REFERENCES:

Daiber, Robert A., and Thomas L. Erekson, Manufacturing Technology: Today and Tomorrow, Columbus, OH: Glencoe Publishing Co., 1991.

Shackelford, Ray, Testing Ductility of Thermoplastics, Muncie, Indiana: Center for Implementing Technology Education, Department of Industry and Technology, Ball State University, Muncie, IN 47306.

Wright, Thomas R., Processes of Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

REFERENCE: 3.9

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Combining by Bonding, Adhesion, Cohesion, Fusion, Mixing, Blending, and Mechanical Methods

MAJOR CONCEPT: Most products are assembled from several mated parts or components.

TOPICS:

1. Mechanical Assembly (screws, bolts, rivets, staples, nails, pins, clips, joints, and seams)
2. Bonding Processes (adhesives)
   - 2.1 Household - glues
   - 2.2 Industrial - thermoplastic adhesives, thermosetting adhesives, and elastomers
3. Heating and Pressure (cohesion)--forge, roll, resistance, induction, energy beam, and friction welding
4. Fusion (gas welding, arc welding, shielded metal arc welding, gas metal arc welding, submerged arc welding, plasma arc welding, thermit welding, laser, and ultrasonic)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Describe the mechanical assembly methods of stitching, retaining ring and clip, pin, nail, rivets, threaded fasteners, and metal seams.
2. Discuss applications of six common wood joints (T-joint, corner joint, butt joint, lap joint, scarf joint, and mortise and tenon).
3. Explain the fusion welding processes of gas welding, metallic arc welding, gas metal arc welding MIG, submerged arc welding, gas tungsten arc welding, plasma arc welding, stud welding, thermit welding, electron beam welding, ultrasonic welding, and laser welding.
4. Explain pressure welding processes (cold welding and explosive welding).
5. Explain heat and pressure welding (forge welding, spot welding, projection welding, seam welding, flash and upset welding, induction welding, friction welding, and diffusion bonding).
6. Explain adhesive bonding (thermoplastic adhesives, thermosetting plastics, and elastomers).
7. Explain brazing, soldering, torch brazing, induction brazing, furnace brazing, resistance brazing, braze welding, and solvent assembly.
8. Perform combining operations selected from Activities 1-7.

CORE INSTRUCTIONAL ACTIVITIES:

1. Make and bond together one or more common wood joints using glue and nails (group of students, one joint per group).
2. Weld together two pieces of metal using oxyacetylene or arc welding.
3. List and describe the stresses acting upon adhesives (tensile, shear, cleavage, peel, torsion, and compression).
4. Solder or braze two pieces of metal.
5. Combine dissimilar metal using adhesive bonding.

6. Design, manufacture, and bond a wood cutting board.
7. Design and manufacture a clipboard, and pop rivet the spring clip.
8. Combine two pieces of metal with rivets.
9. Flock the bottom of a surface.
10. Glue formica to another surface.
11. Sweat solder copper pipe fitting.
12. Pressure bond soap or clay.
13. Solvent bond Plexiglas.
14. Discuss the degree of permanence of various fasteners.
15. Experiment with various types of mechanical fasteners using activity boards (compare ease of use, permanence, strength, and appearance).
16. Tie-dye a tee shirt or other fabric.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Use the arc welder to make a demonstration of the common welding joints, and mount them on a display board using mechanical fasteners.
2. Test the strength of the common methods of joining woods (nail, nail and glue, screws, glue, and dowels and glue). See references.
3. Mix and blend concrete and cast into patio blocks.
4. Demonstrate pressure welding using clay, or heated plastics using the arbor press.
5. Forge weld two pieces of mild steel.
6. Make various sheet metal seams (e.g., lock, flat lock, S-clip, Pittsburgh, etc.).
7. Silver solder or braze dissimilar metals.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Standard Laboratory Tools and Equipment

Arbor Press	Oxyacetylene Torch
Anvil	Arc Welder
Soldering Iron	MIG Welder
Propane Torch	Safety Equipment

MATERIALS/CORE:

Materials Dependent on Activities Selected

TOOLS AND EQUIPMENT/ADVANCED:

Standard Laboratory Tools and Equipment

Oxyacetylene	Spot Welder
Arbor Press	MIG Welder
Patio Block Mold	Anvil
Forging Hammers	Borax Flux

MATERIALS/ADVANCED:

Materials Dependent on Activities Selected

APPLICATIONS OF TERMS:

T-Joints
Corner Joint
Butt Joint
Lap Joint
Scarf Joint
Dado
Tongue
Rabbet
Dado Rabbet
Miter
Lock Miter
Lock
Oxyacetylene
Tensile
Shear
Cleavage
Peel
Torsion
Compression
Shielded Arc Welding
Thermosetting Plastic
Resistance
Laminating
Diffusion
Friction
Induction
Forge
Thermal
Ultrasonic
Laser
Electron
Plasma Arc
Thermit Welding
Plasma Arc Welding
Gas Tungsten Arc Welding
Shielded Metal Arc Welding
Electroslag Welding
Submerged Arc Welding
Gas Metal Arc Welding
Flux Cored Arc Welding
Eastomers
Thermoplastic Adhesives

REFERENCES:

Althouse, Andrew D., et al., Modern Welding, South Holland, IL: Goodheart-Willcox Co., Inc., 1986.

Lindbeck, John P., and Irvin T. Lathrop, General Industry and Technology, Encino, CA: Bennett and McKnight, 1986.

Shackelford, Ray, Mf-M-008, Comparing Mechanical Fastener in Wood, Center for Implementing Technology Education (CITE), Department of Industry and Technology, Ball State University, Muncie, IN 47306, 1986.

Shackelford, Ray, MF-M-004, Natural Polymer (Wood) Cleavage Test, Center for Implementing Technology Education (CITE), Department of Industry and Technology, Ball State University, Muncie, IN 47306.

Smith, Dave, Welding Skills and Technology, New York: McGraw-Hill Book Co., 1984.

Wright, R. Thomas, Process of Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

REFERENCE: 3.10

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Coating

MAJOR CONCEPT: Coating processes alter or treat the surface of products to protect them from the environment and improve appearance.

TOPICS:

1. Inorganic Coating (chromium plated metal, anodized aluminum, oxide coated steel, and galvanized iron or steel, and lead based coverings)
2. Organic (paints, plastic coverings, types of solvents, methods of film formation, and types of binders)
3. Methods Used to Prepare Materials for Coating (alkaline cleaning, water rinsing, and mechanical preparation)
4. Steps in Various Finishing Processes
5. Porcelain Enameling Processes
6. Costing Processes (brushing, printing, spraying, dipping, etc.)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Perform coating operations using necessary steps in finishing.
2. Use inorganic coating materials.
3. Use common organic coating materials.

CORE INSTRUCTIONAL ACTIVITIES:

1. Glaze a ceramic piece.
2. Porcelain enamel a copper object.
3. Electroplate using chromatic coating.
4. Prepare materials for finishing by mechanical, chemical, and electrochemical methods.
5. Abrasive clean iron or steel (sanding, polishing, and buffing).
6. Burnish metal or plastic.
7. Clean materials chemically (pickling, alkaline, and ultrasonic cleaning).
8. Steam clean materials.
9. Vapor degrease oil metal.
10. Flame clean (oxyacetylene).
11. Use organic coating to finish a product using one of the following:
    - 11.1 Brush coating
    - 11.2 Roll coating
    - 11.3 Dip coating
    - 11.4 Flow coating
    - 11.5 Curtain coating
    - 11.6 Spray coating
    - 11.7 Electrocoating
    - 11.8 Printing
    - 11.9 Power coating
    - 11.10 Heat transfer coating
12. Wax and buff a material or product.
13. Compete with classmates to see who can best clean, prepare, and coat a piece of metal (using teacher provided, rusted sheet metal blanks).
14. Spray, brush, and dip a material, and compare the result.
15. Screen print a logo on different materials.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Anodize or electroplate an aluminum product (jewelry, picture, old spoon, or chisel made in prior activity).
2. Photo anodize using different-colored dyes on various types of materials.
3. Use photo anodizing to make a nameplate.
4. Select other activities from core.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Electroplating Equipment
Disk Sander
Polishing Wheel
Wire Brushes
Steam Cleaner
Paint Sprayer
Offset Press
Oxyacetylene Torch
Belt Sander
Buffing Wheel
Burnishing Tools
Ultrasonic Cleaner
Oxyacetylene Torch
Paintbrushes
Silk Screen
Porcelain Enameling Equipment

MATERIALS/CORE:

Electrolyte Solution
Polishing Compound
Oxygen
Paint
Solvent
Enameling Material
Silk Screen Ink Solvent
Electroplate Material
Acid
Acetylene
Ink
Wax
Silk Screen Ink
Ceramic Glaze

TOOLS AND EQUIPMENT/ADVANCED:

Core Tools/Equipment
Process Camera
Vacuum Frame
Anodizing Tanks
Film Developing Tanks

MATERIALS/ADVANCED:

Core Materials
Film
Fixer
Anodizing Solutions
Developer
Stop Bath
Anodizing Dyes

APPLICATIONS OF TERMS:

Glaze
Sanding
Buffing
Brushing
Alkaline
Electropolishing
Electrode
Polymerization
Polishing
Burnishing
Pickling
Ultrasonic
Anodizing
Diffusion Coating

Metalizing Wire
Stirring
Shaking
Screen Printing
Printing
Plating
Flocking
Vacuum
Blending
Pouring
Dyeing
Dipping
Toweling

REFERENCES:

Lindbeck, John P., and Irvin T. Lathrop, General Industry and Technology, Encino, CA: Bennett and McKnight, 1986.

Wright, R. T., Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1984.

Wright, Thomas R., Processes of Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

REFERENCE: 3.11

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Production Management

MAJOR CONCEPT: Six areas of concern for the production manager are input, storage and production, quality, personnel, materials handling, and overall economy.

TOPICS:

1. Obtaining Inputs (equipment, finances, materials, personnel, energy, and knowledge)
2. Storage and Production (receive and store raw materials, produce product, and store or ship finished product)
3. Quality (acceptable quality product produced with minimum waste)
4. Personnel (meeting at least the minimum job demands for operating equipment to produce the product--knowledge, skills, and work attitudes)
5. Materials Handling (ability to efficiently handle materials from raw materials to delivered products by utilizing conveyors, cranes, robots, computers, and other technological methods)
6. Overall Economy (methods used will produce the greatest profit at the lowest cost)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify six production considerations in manufacturing the class product.
2. Determine the storage capacity needed for the class product.
3. Select the most effective methods needed to manufacture the class product.

CORE INSTRUCTIONAL ACTIVITIES:

1. Determine the most effective methods needed to manufacture the class product.
2. Develop a production monitoring system to be used with the class product.
3. Calculate the needed space to store materials and finished products using the parts list from the class product and the dimensions of your laboratory.
4. Identify and calculate overhead costs of producing the product.
5. Develop a flow chart that will show the production process of the class product.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Design and build a conveyor system to handle raw materials and finished products.
2. Determine which parts should be produced in the plant and which products should be purchased using the list of parts from the class product.
3. Do a "break-even" chart on the class product based on fixed overhead, variable materials, and labor costs.

4. Do "time and motion" studies on various activities required to produce the class product, and determine the wage cost per unit, given a specified wage per hour.
5. Perform Core Activities 1, 2, 3, and 5 for the class project.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Classroom/Laboratory Equipment
Stopwatches
Calculators/Computers
Etc.

MATERIALS/CORE:

Classroom Materials and Supplies
Time-Motion Charts for Examples to Be Given to Students

TOOLS AND EQUIPMENT/ADVANCED:

Same
Conveyor Parts (rollers, belts, gears, etc., depending on system design)

MATERIALS/ADVANCED:

Same
Belting Material for Conveyor (rollers, belts, etc.)

APPLICATIONS OF TERMS:

Energy
Quality
Availability
Computers
Flowchart
Production Capacity
Role Play
Robots
Materials Requirement Planning
Allowance Time
Debugging
Jigs
Lead Time
Total Cost
Standardization of Parts
Operations Sheets
Hoists
Rollers
Parts List
Product Analysis
Input
Materials Handling
Conveyors
Master Production Schedule
Raw Materials
Personnel
Components
Automation
Cost Estimator
Fixed Cost
Labor Cost
Retooling
Efficiency
Designer
Production Controls
Pulleys
Delays
Plant Layout
Work Stations

REFERENCES:

Fales, James, et al., Manufacturing: A Basic Text, Encino, CA: Glencoe Publishing Co., 1986.

Wright, Thomas R., Processes of Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

Wright, Thomas, "Break-Even Analysis," 1986, Center for Implementing Technology Education, Ball State University, Muncie, IN 47306.

REFERENCE: 3.12

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Tooling Up for Production

MAJOR CONCEPT: Tooling up involves obtaining the tools and equipment at the proper plant location and getting ready for production.

TOPICS:

1. Designing and Ordering Any Machines, Tools, and Equipment That Must Be Specially Made (i.e., jigs and fixtures)
2. Supervising the Installation of Machines and Equipment, Start-Up, and Trial Run of a Product
3. Placing Tools and Equipment for Most Efficient and Safe Production
4. Getting the Tools Ready for Production

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Design and construct a jig, fixture, mold, or die to be used in the manufacturing of the class product.
2. Set up the production processes for the class product.
3. Prepare all machines and equipment for production.
4. Conduct a trial production run.
5. Discuss production system problems, and make corrections.

CORE INSTRUCTIONAL ACTIVITIES:

1. Fill out an order/requisition form for necessary machines, equipment, and tools.
2. Design and construct jigs, fixtures, molds, and dies to be used in the manufacture of the class product.
3. Set up laboratory for trial production run.
4. Make trial production run of class product.
5. Monitor, report, and correct production problems.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Plan the layout of the manufacturing laboratory for a production run utilizing computers, conveyors, robots, and other automation techniques.
2. Critique the production process, and suggest any changes to economize production.
3. Do a trial production run to check out the jigs and fixtures and other production processes (can be same as core).
4. Monitor, report, and correct production problems.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Standard Laboratory Equipment
Special Items Needed (depending on class product)

MATERIALS/CORE:

Classroom Materials (e.g., pen, pencil, catalogs from various educational institutions, purchase order blanks, and poster board)
Other Materials (depending on the class product selected)

TOOLS AND EQUIPMENT/ADVANCED:

Same

MATERIALS/ADVANCED:

Same

APPLICATIONS OF TERMS:

Fixtures
Mold
Jog
Layout
Critique
Punch and Die
Tooling Up
Debugging
Utilizing
Economize

REFERENCES:

Fales, James, Everett Sheets, Gregg Mervich, and John Dinan, Manufacturing: A Basic Text, Ventura, CA: Glencoe Publishing Co., 1986.

Wright, R. Thomas, Exploring Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

Wright, Thomas R., Processes of Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

REFERENCE: 3.13

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Inventory Control

MAJOR CONCEPT: Inventory control involves keeping track of all the materials that are needed for production as well as the components and completed units manufactured.

TOPICS:
1. Definition and Purpose of Inventory Control
2. Areas of Inventory Control (raw materials, purchased parts, work in progress, and finished goods)
3. Devices Used in Inventory Control (codes, computers, and automated storage and retrieval)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Define inventory control.
2. Discuss why inventory control is important to manufacturing.
3. Identify the four stages of inventory control. (See suggested topics)
4. Discuss and compare how traditional methods and new technologies are used in inventory control.
5. Devise an inventory control system for class product.

CORE INSTRUCTIONAL ACTIVITIES:
1. Discuss the functional importance of inventory records.
2. Use a flow chart to show where raw materials, work in progress, and purchased parts enter the manufacturing process. Identify points where inventory should be taken.
3. Develop an inventory control system.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Draw a manufacturing floor plan, and show the materials routing plan for the class product.
2. Research and compare the advantages of new technology in inventory control over standard methods.
3. Create a computerized inventory control system to account for all components and completed pieces of the class product.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Standard Classroom Tools and Equipment
Computer

MATERIALS/CORE:

Standard Classroom Materials
Examples of Flowcharts, Floor Plans, etc.

TOOLS AND EQUIPMENT/ADVANCED:
Same

MATERIALS/ADVANCED:
Same

APPLICATIONS OF TERMS:

- Inventory
- Work-In-Progress
- Purchased Parts
- Automated Storage and Retrieval
- Just-In-Time Purchasing and Delivery
- Raw Materials
- Finished Goods
- Unit Cost
- Storage

REFERENCES:

Daiber, Robert A., and Thomas L. Erekson, Manufacturing Technology: Today and Tomorrow, Columbus, OH: Glencoe Publishing Co., 1991.

Fales, James, Everett Sheets, Gregg Mervich, and John Dinan, Manufacturing: A Basic Text, Ventura, CA: Glencoe Publishing Co., 1986.

Wright, R. Thomas, Manufacturing Systems, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

REFERENCE: 3.14

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Quality Control

MAJOR CONCEPT: Quality control is done to help production and to be sure that the product is good enough to be sold.

TOPICS:

1. Quality Control Defined
2. Purpose of Quality Control (incoming materials, work-in-progress, and finished goods)
3. Stages of Inspection of Quality Control
4. Quality Control Devices

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Define quality control.
2. Explain why a company should be concerned with quality control.
3. List and express the importance of each of the four stages of inspection for quality control (incoming raw materials, component manufacture, assembly, and final inspection).
4. Demonstrate how to use selected quality control devices such as jigs, fixtures, gauges, etc.
5. Discuss why maintenance policies, procedures, and records are important to quality control.
6. Make a quality control device.

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss the role and stages of product quality control.
2. Make various measuring devices to check the tolerances of parts from the class product.
3. Identify each step in the class production process where inspection must be done.
4. Locate positions/stations for the quality control inspections of class product/parts on a flowchart or shop layout.
5. Identify and train inspectors needed for assuring quality in the class product.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Perform the five core activities.
2. Design and make all quality control devices for the production line.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Stopwatches	Go No-Go Gauges
Scales	Micrometer

Laboratory Equipment (i.e., lasers, computers, etc., if available)
Other Tools (as needed according to devices made)

MATERIALS/CORE:
Time Charts
Magazines
Flowcharts
Special Materials for Measuring Devices (as needed for class product)

TOOLS AND EQUIPMENT/ADVANCED:
Same

MATERIALS/ADVANCED:
Same

APPLICATIONS OF TERMS:
Quality Control
Process Quality Control
Final Inspection
Stop Blocks (Go No-Go Gauges)
Acceptance Quality Control
In-Process Inspection
Sampling

REFERENCES:
Fales, James, et al., Manufacturing: A Basic Text, Encino, CA: Glencoe Publishing Co., 1986.

Wright, R. Thomas, Manufacturing Systems, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

Wright, Thomas R., Processes of Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

REFERENCE: 3.15

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Producing the Product

MAJOR CONCEPT: Efficient manufacturing production is a result of careful management planning, organizing, and controlling.

TOPICS:
1. Final Checkout of Production System
2. Mass Production

BEHAVIORAL OBJECTIVES:
At the conclusion of this unit the learner will:
1. Conduct a final checkout of the production system.
2. Mass produce and store the products for subsequent packaging.

CORE INSTRUCTIONAL ACTIVITIES:
1. Analyze the production system to make sure that all elements are functioning properly and are ready for mass production.
2. Start up and mass produce the class product.
3. Store finished class product for packaging.

ADVANCED INSTRUCTIONAL ACTIVITIES:
Same

EVALUATION:
Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:
All Tools and Equipment That Have Been Identified to Produce the Class Product

MATERIALS/CORE:
All materials and supplies necessary to produce the class product.

TOOLS AND EQUIPMENT/ADVANCED:
Same

MATERIALS/ADVANCED:
Same

APPLICATIONS OF TERMS:
Startup
Packaging
Mass Produce
Final Checkout

REFERENCES:

Fales, James, et al., Manufacturing: A Basic Text, Encino, CA: Glencoe Publishing Co., 1986.

Wright, R. Thomas, Exploring Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

Wright, Thomas R., Processes of Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

REFERENCE: 3.16

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Packaging

MAJOR CONCEPT: Most manufactured products are packaged to protect them, to make them easy to distribute, and to promote them.

TOPICS:

1. Functions of a Good Package
2. Steps in Designing a Package
3. Types of Package Materials
4. Considerations in Selecting a Package
5. Design Considerations in Package Graphics
6. Service Manuals

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. List the functions of a good package.
2. Design and build a package, and package the product.
3. Describe four types of plastic packages (shrink, bags, skin, and blister).
4. Discuss three important considerations in package design (product identity, package graphics, customer appeal, and ease of use).
5. List types of packaging materials and material forms (plastic, cardboard, pallet, boxes, bags, etc.).
6. Identify reasons for packaging the product (protection, storing and shipping, holding and containing, identification and display, advertising, and ease of using product).
7. Provide a service manual that describes how to maintain and repair a manufactured product.

CORE INSTRUCTIONAL ACTIVITIES:

1. Analyze packages provided by the teacher to determine how well they protect the product, promote the product, and provide useful information for the consumer.
2. Provide graphics for the outside of a package.
3. Develop a service manual that describes how to maintain and repair a manufactured product. (If the class has manufactured a product, that product should be used in this activity.)
4. Set up a production/assembly line, make the package, and package/label the class product.
5. Identify important considerations in packaging design such as product identity (trademark and brand name), package graphics (colors going with product and all required information included), and customer acceptance (pleasing customers and meeting their needs).
6. Describe and explain the uses of plastic packaging including shrink, bags, skin, and blister methods.
7. Identify reasons for packaging a product (i.e., protection, storing and shipping, holding and containing, identification and display, and advertising).

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Set up a classroom display with as many types of packages as possible.
2. Design and make a package using thermoforming plastics.
3. Package class product (See core activities).

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Art Supplies (scissors, utility knife, markers, etc.)

Heat Gun	Oven
Plastic Cutter	Hair Dryer
Hot Glue Gun	Hot Wire Styrofoam Cutter
X-Acto Knife	

MATERIALS/CORE:

Art Materials (paper, glue, etc.)

Plastic	Plastic Shrink Wrap
Cardboard	Styrofoam
Tape	Mailing Tape

TOOLS AND EQUIPMENT/ADVANCED:

Same
Plastics Thermoforming Machine

MATERIALS/ADVANCED:

Same

APPLICATIONS OF TERMS:

Package	Packaging
Thermoform	Cardboard
Scored	Shrink Packaging
Blister Pack	Skin Pack

REFERENCES:

Daiber, Robert A., and Thomas L. Erekson, Manufacturing Technology: Today and Tomorrow, Columbus, OH: Glencoe Publishing Co., 1991.

Wright, R. Thomas, Exploring Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

Wright, R. Thomas, Manufacturing Systems, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

REFERENCE: 4.1

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Maintaining and Servicing Products

MAJOR CONCEPT: Servicing (post processing) is done on manufactured products to keep them functioning, to make them last longer, and to maintain their value.

TOPICS:
1. Difference Between Repair and Maintenance
2. Steps in a Product Use Cycle (install, maintain, repair, alter, or replace)
3. Steps Used to Repair Products (diagnose and correct)
4. Economics of Replacement Versus Repair
5. Servicing by Manufacturer, Special Service Firms, or the Customer

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:
1. Explain the difference between repair and maintenance of products.
2. Describe the steps in a product use cycle.
3. List servicing groups (manufacturers, special service firms, and customers).
4. Explain the economics of replacement versus repair.
5. State the training/skills needed by specified service personnel.
6. Identify products in the home that require periodic service.
7. Service a piece of laboratory equipment or other equipment (i.e., lubrication).

CORE INSTRUCTIONAL ACTIVITIES:
1. Prepare a service schedule for the class project.
2. Discuss the difference between maintenance and repair.
3. Perform service or maintenance on a product provided by the teacher (bike, lawn mower, laboratory equipment, etc.).
4. Discuss service occupations and careers.

ADVANCED INSTRUCTIONAL ACTIVITIES:
1. Design a training program for servicing a teacher-assigned product (bike, lawn mower, etc.).
2. Make a list of manufactured products in the home that may need to be serviced.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Standard Classroom Equipment

MATERIALS/CORE:

As Needed (for teacher assignment)

TOOLS AND EQUIPMENT/ADVANCED:
As Needed (for teacher assignment)

MATERIALS/ADVANCED:
Same

APPLICATIONS OF TERMS:

Diagnosing	Install
Maintain	Maintenance
Recycle	Repair
Salvage	

REFERENCES:

Daiber, Robert A., and Thomas L. Erekson, Manufacturing Technology: Today and Tomorrow, Columbus, OH: Glencoe Publishing Co., 1991.

Fales, James, et al., Manufacturing: A Basic Text, Columbus, OH: Glencoe Publishing Co., 1986.

Wright, R. Thomas, Exploring Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

REFERENCE: 4.2

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Marketing and Distribution

MAJOR CONCEPT: Products must be promoted and distributed to the buyer in order to return a profit.

TOPICS:

1. Types and Functions of Advertisement
2. Steps in Creating an Advertisement (develop the message, design the presentation, and produce the advertisement)
3. Channels of Distribution
4. Coordinating Distribution
5. Wholesalers, Retailers, and Direct Delivery

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Identify two types of advertisements (promoting a product or promoting an idea).
2. Explain the function of a good advertisement.
3. Discuss three basic steps in creating an advertisement.
4. List and describe three major channels of distribution.
5. Design an advertisement for the class product.

CORE INSTRUCTIONAL ACTIVITIES:

1. Collect examples of advertisements which promote an idea and a product.
2. Analyze examples of advertisements, and discuss whether they are "good" or "bad" advertisements.
3. Create an advertisement for a class product.
4. Discuss distribution channels (direct, retail, and wholesale).
5. Develop an order form for a class product.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Create a video sales presentation promoting the class product.
2. Role-play the job of sales manager, and develop a motivational plan to encourage more sales from the sales staff.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

Art Supplies

MATERIALS/CORE:

Newspapers
Periodicals
Poster Board

TOOLS AND EQUIPMENT/ADVANCED:
Video Equipment

MATERIALS/ADVANCED:
Same

APPLICATIONS OF TERMS:

Advertising	Advertising Agency
Graphics	Industrial Sales
Authorized Dealer	Layout
Commission	Public Service Advertising
Quota	Storyboard
Retail Sales	Motivation
Sales Forecast	Territories
Salesperson	Distribution Channels

REFERENCES:

Wright, R. Thomas, Exploring Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

Wright, R. Thomas, Manufacturing Systems, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

Wright, Thomas R., Processes of Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

REFERENCE: 4.3

MAJOR TITLE: Manufacturing Technology

UNIT TITLE: Liquidating a Company

MAJOR CONCEPT: Liquidation (dissolution) is a legal process of settling a corporation's accounts and going out of business.

TOPICS:

1. Voluntary Liquidation
2. Involuntary Liquidation
3. Steps in Dissolution (filing legal documents, closing operations, selling assets, and distributing money)

BEHAVIORAL OBJECTIVES:

At the conclusion of this unit the learner will:

1. Explain reasons for voluntary liquidation of a corporation.
2. Explain reasons for involuntary liquidation of a corporation.
3. List the steps involved in dissolving a company.
4. List the assets that need to be sold to settle all debts.
5. Explain how to divide profits among stockholders.

CORE INSTRUCTIONAL ACTIVITIES:

1. Discuss the reasons for company liquidation.
2. Discuss the steps involved in liquidating a corporation.
3. Dissolve the class corporation.

ADVANCED INSTRUCTIONAL ACTIVITIES:

1. Categorize the class corporation's assets that must be sold (plant and equipment, materials and work-in-process, finished goods, product plans and process information, etc.).
2. Dissolve the class corporation.

EVALUATION:

Lessons will be evaluated by teacher-made tests and successful completion of core and advanced instructional activities as assigned by the teacher.

TOOLS AND EQUIPMENT/CORE:

None

MATERIALS/CORE:

Class Corporation Assets

TOOLS AND EQUIPMENT/ADVANCED:

None

MATERIALS/ADVANCED:

Class Corporation Assets

APPLICATIONS OF TERMS:

Bankruptcy	Capitalism
Creditor	Dissolution
Involuntary	Voluntary
Liquidation	Assets
Certificate of Dissolution	

REFERENCES:

Wright, R. Thomas, and Richard M. Henak, Exploring Production, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

Wright, R. Thomas, Exploring Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1985.

Wright, Thomas R., Processes of Manufacturing, South Holland, IL: Goodheart-Willcox Co., Inc., 1990.

RESOURCE LIST

RESOURCE LIST

This list represents possible sources of items from independent concessionaires and entrepreneurs that are not available from the National Aeronautics and Space Administration, and it is offered without recommendation or endorsement by NASA. Inquiry should be made directly to the appropriate source to determine availability, price, and time required to fill orders (before sending money).

SCIENTIFIC AND TECHNICAL INFORMATION (MISSION REPORTS):

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22151

Scientific and Technical Information Facility
800 Elkridge Landing Road
Linthcum Heights, Maryland 21090

SPACECRAFT AND AIRPLANE MODELS:

Models of spacecraft and aircraft may be purchased at hobby shops and toy departments of your local department stores and also at some of the companies listed below. The following firms are model-rocket manufacturers:

Estes Industries, P.O. Box 227, Penrose, CO 81240
Revell, Inc., 4288 Glencoe Avenue, Venice, CA 90291
Centum Engineering Co., P.O. Box 1988, Phoenix, AZ 85001
Flight Systems, Inc., 9300 East 68th Street, Raytown, MO 64133
Pacific Miniatures, Inc., Morton Grove, IL 60053

SOUVENIRS AND MEMORABILIA COMMEMORATING SPACE SUCH AS CAMERAS, TEXTBOOKS, PHOTOGRAPH ALBUMS, EMBLEMS, PATCHES, COMMEMORATIVE MEDALS, FLIGHT JACKETS, T-SHIRTS, CAPS, BUTTONS, ETC.:

AW/JSC Exchange Store, Johnson Space Center, Houston, TX 77058
Alabama Space and Rocket Center, Tranquility Base, Huntsville, AL 35807
Space Age Enterprises, P.O. Box 58127, Houston, TX 77058
National Medallion Company, Inc., P.O. Box 58127, Houston, TX 77058
KSC Tours, TWA Services, Inc., TWA-810, Kennedy Space Center, FL 32935
Communications Association Corp., 250 Babcock Street, Melbourne, FL 32935
Visitor Information Center, Gift Shop, Johnson Space Center, Houston, TX 77058
Smithsonian Institute Museum Shops, 900 Jefferson Drive SW, Washington, DC 20560
NASA/Headquarters Exchange Store, 600 Maryland Ave., SW, Washington, DC 20546

SPACE SUITS:

ILC-Dover, Box 266, Fredenca, DE 19946
Hamilton Standard, Windsor Locks, CT 06096

STAMPS:

JSC Stamp Club, P.O. Box 58328, Houston TX 77058
Houston Hobby Center, P.O. Box 10791, Houston, TX 77018

MAPS: MOON, MARS, ETC.:

Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402
National Geographic Society, P.O. Box 2806, Washington, DC 20036

PHOTOGRAPHS, SLIDES, ETC.:

AW/JSC Exchange Store, Johnson Space Center, Houston, TX 77058
Astronomical Society of the Pacific, 1290 24th Avenue, San Francisco, CA 94122
Woodstock Products, Inc., P.O. Box 2519, Beverly Hills, CA 90213

8MM AND 16MM NASA FILMS:

National Audio Visual Center (GSA), Washington, DC 20409

SPACE-TYPE FREEZE-DEHYDRATED FOODS:

Oregon Freeze-Dry Foods, Inc., P.O. Box 1048, Albany, OR 97321
Sam-Andy Foods, P.O. Box 1120, Colton, CA 92324
Freeze Dry Products, 321 Eighth Street, NW, Evansville, IN 47708
G. Armanino & Sons, Inc., 1970 Carroll Avenue, San Francisco, CA 94124
Right-A-Way Foods, P.O. Box 184, Edinburg, TX 78539
Spaceland Enterprises, P.O. Box 775, Merritt Island, FL 32952

SOLAR SYSTEMS INFORMATION, CHARTS, ETC.:

The Hansen Planetarium, Department F, 1098 South 200 West, Salt Lake City, UT 84101
Smithsonian Astrophysical Observatory, 60 Garden Street, Cambridge, MA 02138
Astronomical Society of the Pacific, 1290 24th Avenue, San Francisco, CA 94122

SPECIAL SOURCES:

Abstracts of technical reports on imagery from Earth Resources Satellites (LANDSAT) funded by NASA, prepared and distributed by National Technical Service of Department of Commerce as a weekly bulletin; abstracts on NASA-owned inventions available for licensing:

U.S. Department of Commerce
National Technical Information Service
Springfield, VA 22161

LANDSAT (formerly known as "ERTS") photographs available to persons and groups not qualified as LANDSAT principal investigators to receive pictures directly from NASA: costs range from $1.25 for a 70mm black and white contact print to $27 for a 40 x 40 inch color transparency.

Technology Applications Center
University of New Mexico
Albuquerque, NM 87106

specializes in remote sensing technology

EROS Data Center
Department of Interior
10th & Dakota Avenue
Sioux Falls, SD 57198

LANDSAT and Skylab imagery, and NASA aircraft data

National Oceanic and Atmospheric Administration
Department of Commerce
EROS Data Center
Suitland, MD 20023

data in oceanographic, hydrologic, and atmospheric sciences

National Climatic Center
NOAA Environmental Data Services
Federal Building
Asheville, NC 28801

Western Aerial Photograph Laboratory
Agricultural Stabilization & Conservation Service
U.S. Department of Agriculture
2505 Parley's Way
Salt Lake City, UT 84109

agricultural imagery and data

SPACE CAMP INFORMATION:

Alabama Space & Rocket Center
Space Camp Applications
Tranquility Base
Huntsville, AL 35807

POWER FACTORY CONTROLLER DISTRIBUTOR:

Energy Vent, Inc.
915 Valley Street
Dayton, OH 45404

NASA EDUCATION OFFICES:

NASA publications should be ordered from the Superintendent of Documents, Government Printing Office. Other inquiries may be directed to the Educational Office at the NASA Center which is designated to serve your state as indicated in the list below.

If you live in:		Write to Education Office of:
Alaska	Nevada	NASA Ames Research Center
Arizona	Utah	Monen Field, California 94035
California	Wyoming	
Hawaii	Oregon	
Idaho	Washington	
Montana		

If you live in:		Write to Education Office of:
Connecticut Delaware Maine Massachusetts New Jersey Rhode Island	Pennsylvania Vermont Maryland New York New Hampshire District of Columbia	NASA Goddard Space Flight Center Greenbelt, Maryland 20771
Colorado Kansas Nebraska North Dakota	South Dakota New Mexico Oklahoma Texas	NASA Lyndon B. Johnson Space Center Houston, Texas 77058
Florida Georgia	Puerto Rico Virgin Islands	NASA John F. Kennedy Space Center Kennedy Space Center Florida 32899
Kentucky North Carolina South Carolina	Virginia West Virginia	NASA Langley Research Center Langley Station Hampton, Virginia 23665
Illinois Indiana Michigan	Minnesota Ohio Wisconsin	NASA Lewis Research Center 21000 Brookpark Road Cleveland, Ohio 44135
Alabama Arkansas Iowa Louisiana	Mississippi Missouri Tennessee	NASA George C. Marshall Space Flight Center Marshall Space Flight Center Alabama, 35812

ENGINEERING

Engineer's Council for Professional Development, 345 East 47th Street, New York, NY 10017. The following guidance materials are available from ECPD. Single copies (except where noted) will be sent to students and counselors:

After High School--What (EC-13) 1969
Do I Have Engineering Aptitude? (EC-14) 1969
Guidance Counselor Kit (EC-19) 1973 S4
Engineering: Creating A Better World (EC-62) 1970
New Careers in Engineering Technology (EC-63) 1970
Make Your Career Choice Engineering (EC-68) 1974
The Engineering Team (EC-69) 1974
Engineering Career Series (EC-70) 1973
Minorities in Engineering (EC-71) 1974
Accredited Curricula Leading to Degrees in Engineering (EC-20) 1972
List of Accredited Curricula Leading to Degrees in Engineering Technology
(EC-21) 1972

Industrial Engineering, The Professional With a Future, The American Institute of Industrial Engineers, Inc., 25 Technology Park, Atlanta, GA 30071, (1974).

Manufacturing Engineering, A Rewarding Career, The Society of Manufacturing Engineering Engineers, 20501 Ford Road, Dearborn, MI 48128, (1974).

Mechanical Engineering, The American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, NY 10006, (1973).

The Metallurgical Engineering Technician, American Society for Metals, Metals Park, OH 44073, (1972).

Road to Graduate School In Engineering, American Society of Engineering Education, One Dupont Circle, Suite 400, Washington, DC 20036, Revised periodically, 50¢.

Science and Engineering Careers - A Bibliography, 7th Edition, Scientific Manpower Commission, American Academy for the Advancement of Science, 1776 Massachusetts Avenue, NW, Washington, DC 20036, (1974), $2.

Team 'work', American Institute of Industrial Engineers, Inc., United Engineering Center, 345 East 47th Street, New York, NY 10017, (1972).

The Certification of Engineering Technicians, Institute for the Certification of Engineering Technicians, 2029 K Street, NW, Washington, DC 20006, (1974).

The Engineering Technician, American Society for Engineering Education, Suite 400, One Dupont Circle, Washington, DC 20036, (1970).

The Future Belongs to the Chemical Engineer, American Institute of Chemical Engineers, 345 East 47th Street, New York, NY 10017, (1973).

The Jets Program, The Junior Engineering Technical Society, United Engineering Center, 345 East 47th Street, New York, NY 10017.

Women in Engineering Careers, Society of Women Engineers, United Engineering Center, Room 305, 345 East 47th Street, New York, NY 10017, (1970).

Your Challenge in Electrical Engineering, Institute of Electrical and Electronics Engineers, Inc., 345 East 47th Street, New York, NY 10017, (1972).

INDUSTRY

An Introduction to Die Casting, The Society of Die Casting Engineers, 14530 West 8 Mile Road, Detroit, MI 48237, (1970).

Careers in Metallurgy, Materials Science, and Metallurgical Engineering, The Metallurgical Society of AIME, 345 East 47th Street, New York, NY 10017, (1974).

Careers in Quality, American Society for Quality Control, 161 West Wisconsin Avenue, Milwaukee, WI 53203, (1974).

Directory of Colleges and Universities Offering Photography Instruction, Professional Photographers of America, 1090 Executive Way, Oak Leaf Commons, Des Plaines, IL 60018, (1974).

Directory of Transportation Education, National Defense Transportation Association, 1612 K Street, NW, Washington, DC 20006, (1972).

Education for Technical Writers, Society for Technical Communication, Suite 421, 1010 Vermont Avenue, NW, Washington, DC 20005, (1970).

Focus on the Future, Professional Photographers of America, 1090 Executive Way, Oak Leaf Commons, Des Plaines, IL 60018, (1972).

Is Technical Writing Your Career?, Society for Technical Communication, Suite 421, 1010 Vermont Avenue, NW, Washington, DC 20005, (1971).

Machine Tools/American Muscles, National Machine Tool Builders, 2139 Wisconsin Avenue, NW, Washington, DC 20007, (1969).

Measurement and Control Industry, Scientific Apparatus Makers Association, 370 Lexington Avenue, New York, NY 10017, (1972).

Planning a Career in Electronics, Electronic Industries Association, 2001 "I" Street, NW, Washington, DC 20006, (1971).

Your Introduction to Photogrammetry, The American Society of Photogrammetry, 105 N. Virginia Avenue, Falls Church, VA 22046, (1973).

Your Career in Fluid Power, The Fluid Power Society (FPS), 432 East Kibourn Avenue, Milwaukee, WI 53201, (1973).

A Bright Future For You As a Chemical Technician, Manufacturing Chemists Association, 1825 Connecticut Avenue, NW, Washington, DC 20009, (1972).

A Career in Astronomy, American Astronomical Society, 211 Fitz Randolph Road, Princeton, NJ 08540, (1972).

A Career in Ecology, Ecological Society of America, Department of Botany, University of North Carolina, Chapel Hill, NC 27514, (1972).

A Career in Metallurgy Will Extend Your Reach, Career Development Office, American Society for Metals, Metals Park, OH 44073, (1970).

Accredited Curricula in Chemical Engineering, American Institute of Chemical Engineers, 345 East 47th Street, New York, NY 10017, (1973).

Biological Photograph - A Challenging Profession, Biological Photographic Association, Box 1057, Rochester, MN 55901, (1973).

Agricultural Careers in Science, Business and Education, Ak-Sar-Ben-Ag Youth Foundation, 110-C Information, College of Agriculture, University of Nebraska, Lincoln, NE 68053, (1974), 25¢.

Careers in Biology, American Institute of Biological Sciences, 3900 Wisconsin Avenue, NW, Washington, DC 20016, (1971).

Careers Ahead in the Chemical Industry, Manufacturing Chemists Association, 1825 Connecticut Avenue, NW, Washington, DC 20009, (1971).

Careers in Exploration Geophysics, Society of Exploration Geophysics, Box 3098, Tulsa, OK 74101, (1971).

Careers in Statistics, Committee of Presidents of Statistical Societies, American Statistical Association, 806 15th Street, NW, Washington, DC 20005.

Career Opportunities in Metallurgy, Office of Career Development, American Society for Metals, Metals Park, OH 44073, (1970).

Chemistry and Your Career, American Chemical Society, 1155 16th Street, NW, Washington, DC 20036, (1970).

Curricula in the Atmospheric Sciences, The American Meteorological Society, 45 Beacon Street, Boston, MA 02108, revised periodically, ($4).

Directory of Geoscience Departments, American Geological Institute, 2001 M Street, NW, Washington, DC 20037, revised periodically, ($4).

Documentary Research for Environment/Ecology Education (E/EE) - A Bibliography, Institute of Environmental Sciences, 940 East Northwest Highway, Mt. Prospect, IL 60056, $1.50, (1972).

Environmental Health Programs, Graduate Level, National Environmental Health Association, 1600 Pennsylvania Street, Denver, CO 80203, (1971).

Environmental Health Technician, National Environmental Health Association, 1800 Pennsylvania Street, Denver, CO 80203, (1971).

Environmental Programs in Two-Year Colleges, National Environmental Health Association, 1600 Pennsylvania Street, Denver, CO 80203, (1971).

Geology - Science and Profession, American Geological Institute, 2201 M Street, NW, Washington, DC 20037, 35¢, (1970).

Geophysics, The Earth in Space, American Geophysical Union, 2100 Pennsylvania Avenue, NW, Washington, DC 20037, (1972).

Guidebook to Departments in the Mathematical Sciences, The Mathematical Association of America, 1225 Connecticut Avenue, NW, Washington, DC 20036, revised periodically, ($1).

How About a Career In Mathematics?, The Mathematical Association of America, 1225 Connecticut Avenue, NW, Washington, DC 20036, (1972).

Keys to Careers in Science and Technology, National Science Teachers Association, 1742 Connecticut Avenue, NW, Washington, DC 20009, (1973), $1.

Microbiology in Your Future, American Society for Microbiology, 1913 "I" Street, NW, Washington, DC 20006, (1974).

Oceanography Information Kit, National Oceanography Association, 1900 L Street, NW, Washington, DC 20036, 1972, ($2).

Physics As a Career, American Institute of Physics, 335 East 45th Street, New York, NY 10017, (1970).

Post-Secondary Curricula in Environmental Technology, National Sanitation Foundation, Box 1468, Ann Arbor, MI 48106, (1971).

Preparing for a Career in Oceanography, Scripps Information on Oceanography, P.O. Box 109, La Jolla, CA 92037.

Programs of Training and Education in Environmental Technology, National Sanitation Foundation, Box 1468, Ann Arbor, MI 48106, (1972).

Science and Engineering Careers, Scientific Manpower Commission, American Association for the Advancement of Science, 1776 Massachusetts Avenue, NW, Washington, DC 20036, (1974).

Test Yourself in Science, Scientific Manpower Commission, American Academy for the Advancement of Science, 1776 Massachusetts Avenue, NW, Washington, DC 20036, (1971), $1.

The Challenge of Meteorology, The American Meteorological Society, 45 Beacon Street, Boston, MA 02108, (1971).

The Environmentalist, National Environmental Health Association, 1600 Pennsylvania Street, Denver, CO 80203, (1973).

The Sphere of the Geological Scientist, American Geological Institute, 2001 M Street, NW, Washington, DC 20037, (1970).

Undergraduate Environmental Health Curricula, National Environmental Health Association, 1600 Pennsylvania Street, Denver, CO 80203, (1971).

You'll Need Math, The Mathematical Association of America, 1225 Connecticut Avenue, NW, Washington, DC 20036, (1971).

ADDITIONAL SOURCES OF INFORMATION

Engineering Manpower Commission, 345 East 47th Street, New York, NY 10017.

National Aerospace Education Association, Shoreham Building, 806 15th Street, NW, Washington, DC 20005.

Federation of Americans Supporting Science and Technology, 1785 Massachusetts Avenue, NW, Washington, DC 20036.

National Aeronautic Association, Room 610, 806 15th Street, NW, Washington, DC 20005.

Aerospace Youth Council, 1785 Massachusetts Avenue, NW, Washington, DC 20036.

Aerospace Education Foundation, 1750 Pennsylvania Avenue, NW, Washington, DC 20006.

Aviation Technician Education Council, P.O. Box 51133, Tulsa, OK 74151.

Aviation Distributors and Manufacturers Association, 1900 Arch Street, Philadelphia, PA 19103.

GENDER EQUITY

National Women's History Project, 7738 Bell Road, Windsor, CA 95492-8518 (math and science instructional materials).

WEE Publishing Center, Education Development Center, Inc., 55 Chapel Street, Suite 200, Newton, MA 02158-1060 (math and science instructional materials).

GOVERNMENT SOURCES

National Aeronautics and Space Administration Educational Publications, NASA, Washington, DC 20546, (1974).

NASA Film List, National Aeronautics and Space Administrator, Washington, DC 20546, (1973).

Occupational Outlook Reprint Services, U.S. Department of Labor, Bureau of Labor Statistics, Washington, DC 20402.

> Aircraft, Missiles and Spacecraft, #123, 25¢.
> Civil Aviation, #138, 35¢.
> Engineers, #63, 30¢.
> Environmental Scientists, #64, 30¢.
> Physical Scientists, #67, 30¢.
> Technicians, #68, 30¢.

Federal Careers for Technicians in Engineering and Physical Science, U.S. Civil Science Commission, 1900 E Street, NW, Washington, DC 20415, (1972).

Career Materials, Department of Transportation, Federal Aviation Administration, Office of Information Services, Public Information Center, 800 Independence Avenue, SW, Washington, DC 20591.

Learning About Space Careers, NASA, U.S. Government Printing Office, #EP-32, Washington, DC, 25¢.

Air Traffic Controllers - Special Breed, Federal Aviation Administration, Washington National Airport, Washington, DC 20001, (1971).

25 Technical Careers You Can Learn in Two Years or Less, Career, U.S. Department of HEW, Office of Education, Washington, DC 20202.

Careers for Women As Technicians, U.S. Department of Labor, Women's Bureau, Washington, DC 20210.

Career Education in the Environment - A Handbook, Superintendent of Documents, Government Printing Office, Washington, DC 20402, 1780-0892, 1972, ($3).

PUBLISHERS

Listed below are the publishers who have responded to a request for materials relating to careers in aerospace. The scope and format of the information varies from company to company. It is suggested that interested parties write to these firms for a listing of career materials.

Alumnae Advisory Center, 541 Madison Avenue, New York, NY 10022.

B'nai B'rith Career and Employment Services, 1640 Rhode Island Avenue, NW, Washington, DC 20036.

Careers, Inc., Box 135, Largo, FL 33540.

Chronicle Guidance Publications, Inc., Moravia, NY 13118.

Dodd, Mead, and Company, 79 Madison Avenue, New York, NY 10016.

J. G. Ferguson Publishing Company, 6 North Michigan Avenue, Chicago, IL 60602.

Julian Messner, 1 West 39th Street, New York, NY 10018.

William Morrow & Company/Lathrop, Lee and Shepard, 105 Madison Avenue, New York, NY 10016.

Richards Rosen Press, Inc., 29 East 21st Street, New York, NY 10016.

Science Research Associates, Inc., 259 East Erie Street, Chicago, IL 60611.

Vocational Guidance Manuals, 620 South Fifth Street, Louisville, KY 40202.

BUSINESS AND INDUSTRIAL SOURCES

Can I Be a Technician? Let's Find Out, Public Relations Staff, General Motors Corporation, Detroit, MI 48202.

Can I Be an Engineer? Public Relations Staff, General Motors Corporation, Detroit, MI 48202, (1972).

Can I Be a Craftsman? Public Relations Staff, General Motors Corporation, Detroit, MI 48202.

What's It Like to Be an Engineer? Education Relations, General Electric Company, Ossining, NY 10562, (1972).

What's It Like to Be a Technician? Education Relations, General Electric Company, Ossining, NY 10562, (1972).

Aerospace Education, Aero Products Research, Inc., 11201 Hindry Avenue, Los Angeles, CA 90045.

Piper Air Science Education and College in the Clouds, Aero Products Research, Inc., 11201 Hindry Avenue, Los Angeles, CA 90045.

Sperry's There and It's a Cold Cruel World, Sperry Flight Systems, P.O. Box 2111, Phoenix, AZ 85036.

Your Future at Grumman, Grumman Aerospace Corporation, Bethpage, NY 11714.

Your Career in the World of Bendix, Bendix Corporation, Bendix Center, Southfield, MI 48076.

It's Your Turn, Fairchild Industries, 20301 Century Blvd., Germantown, MD 20767.

Tech-Notes, Singer Company, Kearfott Division, 1150 McBride Avenue, Little Falls, NJ 07424.

Blueprint for Future, Vought Systems Division, LTV Aerospace Corporation, P.O. Box 5907, Dallas, TX.

Careers in Aerospace, The Boeing Company, P.O. Box 37073, MS 11-48, Seattle, WA 98124.

Aviation Education Materials, Beech Aircraft Corporation, Education Department, Wichita, KS 67201.

Aviation Education Programs, Cessna Aircraft Company, P.O. Box 1521, Wichita, KS 67201.

THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Guidance workers wishing to make use of NASA professional educators, publications, and/or audiovisual materials in their programs may contact the Educational Program Officer at the NASA Center serving their respective states. See below:

For South Carolina schools, write to
NASA Langley Research Center, Langley Station, Hampton, Virginia 23365
Serving: Kentucky, North Carolina, South Carolina, Virginia, and West Virginia

NASA Ames Research Center, Moffett Field, California 94035
Serving: Alaska, Arizona, California, Hawaii, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming

NASA Marshall Space Flight Center, Marshall Space Flight Center, Alabama 35812
Serving: Alabama, Arkansas, Iowa, Louisiana, Mississippi, Missouri, and Tennessee

NASA Goddard Space Flight Center, Greenbelt, Maryland 20771
Serving: Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont

NASA Johnson Space Center, Houston, Texas 77058
Serving: Colorado, Kansas, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, and Texas

NASA Kennedy Space Center, Kennedy Space Center, Florida 32899
Serving: Florida, Georgia, Puerto Rico, and Virgin Islands

NASA Lewis Research Center, 21000 Brookpark Road, Cleveland, Ohio 44135
Serving: Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin

This bibliography was prepared by the National Career Information Center of the American Personnel and Guidance Association, 1607 New Hampshire Avenue, NW, Washington, DC 20009, (1976).

CAREERS IN AEROSPACE AND RELATED FIELDS

A Listing of Information Sources

Prepared by the National Career Information Center of the American Personnel and Guidance Association in cooperation with the National Aeronautics and Space Administration.

TRADE, PROFESSIONAL AND EDUCATIONAL SOURCES

AEROSPACE AND AVIATION

A Giant Leap for Womankind, Too, National Geographic Society, 17th and M Streets, NW, Washington, DC 20036, (1973), 10¢.

Airport Management - A Profession, American Association of Airport Executives, 2029 K Street, NW, Washington, DC 20006, (1971).

Airworthy - A Career as an A&P Mechanic, General Aviation Manufacturers Association, Suite 1200-A, 1025 Connecticut Avenue, NW, Washington, DC 20036, (1971).

ALPA Occupational Guides, Airline Pilots Association, 1329 E Street, NW, Washington, DC 20004, (1971).

Aviation Education Materials, General Aviation Manufacturers Association, Suite 1200-A, 1205 Connecticut Avenue, NW, Washington, DC 20036, (1972).

Careers in Aerospace, American Institute of Aeronautics and Astronautics, 1290 Avenue of the Americas, New York, NY 10019, (1971).

Careers in Aerospace Medicine and Life Sciences, The Aerospace Medical Association, Washington National Airport, Washington, DC 20001, (1970).

Flight Engineer - Fact Sheet, Flight Engineers' International Association, 905 Sixteenth Street, NW, Washington, DC 20006, (1971).

Going Up! . . . A Career as a Professional Pilot, General Aviation Manufacturers Association, Suite 1200-A, 1025 Connecticut Avenue, NW, Washington, DC 20036, (1971).

Help-Mate . . . A Career Using Personal Flying, General Aviation Manufacturers Association, Suite 1200-A, 1025 Connecticut Avenue, NW, Washington, DC 20036, (1971).

Mr. Aviation . . . A Career as a Fixed Base Operator, General Aviation Manufacturers Association, Suite 1200-A, 1025 Connecticut Avenue, NW, Washington, DC 20036, (1971).

Sky-School . . . A Career as a Flight Instructor, General Aviation Manufacturers Association, Suite 1200-A, 1025 Connecticut Avenue, NW, Washington, DC 20036, (1971).

The People of the Airlines, Air Transport Association of America, 1709 New York Avenue, NW, Washington, DC 20006, (1973).

The World of Agricultural Aviation, National Agricultural Aviation Association, Suite 808, 1101 Seventeenth Street, NW, Washington, DC 20036, (1972).

Transport Career Opportunities, National Defense Transportation Association, 1612 K Street, NW, Washington, DC 20006, (1972), $5.

ENGINEERING

Biomedical Engineering Education Summary Directory 1971, Biomedical Engineering Directory, AIBS/BIAC, 3900 Wisconsin Avenue, NW, Washington, DC 20026, (1971).

Career Guidance Reprints, Society of Women Engineers, 345 East 47th Street, New York, NY 10017, (Dates vary).

Careers in Photographic Science and Engineering, Society of Photographic Scientists and Engineers, 1330 Massachusetts Avenue, NW, Washington, DC 20005, (1973).

Chemical & Engineering News: Career Opportunities for Chemists, Employment Outlook '73, American Chemical Society, 1155 16th Street, NW, Washington, DC 20036, Represent 10.272, $1, (1972).

Chemical Engineering and You . . . , American Institute of Chemical Engineers, 345 East 47th Street, New York, NY 10017, (1970).

Consulting Engineering . . . A Career With a Future, Consulting Engineers Council of the USA, 1155 15th Street, NW, Washington, DC 20005, (1971).

Engineering: A Career of Dedication and Responsibility, National Society of Professional Engineers, 2029 K Street, NW, Washington, DC 20006, (1974).

Engineering Guidance and Counseling, American Society for Engineering Education, One Dupont Circle, Suite 400, Washington, DC 20036, (1972), $2.50.

Engineering Technician, American Society for Engineering Education, One Dupont Circle, Suite 400, Washington, DC 20036, (1971), 50¢.

This bibliography for guidance workers has been designed to identify a variety of information sources in aerospace and related fields. The field of aerospace touches more than aeronautics and space; and the number of scientific, engineering, and technical occupations that are related to this field are worth exploring.

Since young people exploring their futures may have questions about the field of aerospace, guidance workers are urged to acquire the materials listed in this bibliography. They will provide much of the information needed during the exploration phase of career decision making. In four separate sections--Trade, Professional and Educational Sources; Government Sources; Publishers; and Business and Industrial Sources--this guide lists more than 150 occupational and educational materials.

SPACE TRANSPORTATION

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Aboard the Space Shuttle. 1980, S/N 033-000-0086-6, $2.75.
A Meeting With the Universe. 1982, S/N 033-000-00836-8, $14.00.
Apollo. 1974, S/N 033-000-0055-9, $4.75.
ERTS1: A New Window On Our Planet. 1976, S/N 024-001-027 57-7, $15.00.
Food for Space Flight. 1982, S/N 033-000-00851-1, $2.25.
The Next Step: Large Space Structures. 1982, S/N 033-000-00853-8, $2.00.
Occupational Outlook Handbook (present year). S/N 029-001-02651-0, $9.00.
Planetary Exploration Through Year 2000. 1983, S/N 033-000-00871-6, $5.50.
Prelude to the Space Age: The Rocket Societies: 1924-1940, 1983, S/N 047-000-00380-6, $6.50.

Shuttle Lithographs (4 8x10). 1981, S/N 033-000-00833-3, $3.75.
Spacelab 1. 1982, S/N 033-000-00846-5, $4.00.
Space Settlements: A Design Study. 1977, S/N 033-000-00660-1, $10.00.
The Space Shuttle at Work. 1977, S/N 033-000-00779-5, $5.00.
Ten Years of Planetary Exploration (posters). 1983, S/N 033-000-00861-9, $4.50.
The Voyager Flights to Jupiter and Saturn. S/N 033-000-00854-6, $5.50.

AUDIOVISUALS

The following films are available on a free loan from the NASA Lewis Research Center, Office of Educational Services, 21000 Brookpark Road, Cleveland, OH 44135, (216) 433-4000, Ext. 708. Please order films at least 45 days in advance. A NASA films brochure listing additional films is available.

We encourage students to seek the professional assistance of their counselors and personal assistance of people who work in aerospace careers. Exploring the world of aerospace careers will be informative and exciting.

Francis E. Burtnett, Director
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